Rock Products

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New Michigan Lime Plant Has Efficient Layout

Limestone Products Company, Menominee, Improves Over Usual Methods of Handling Limestone and Coal

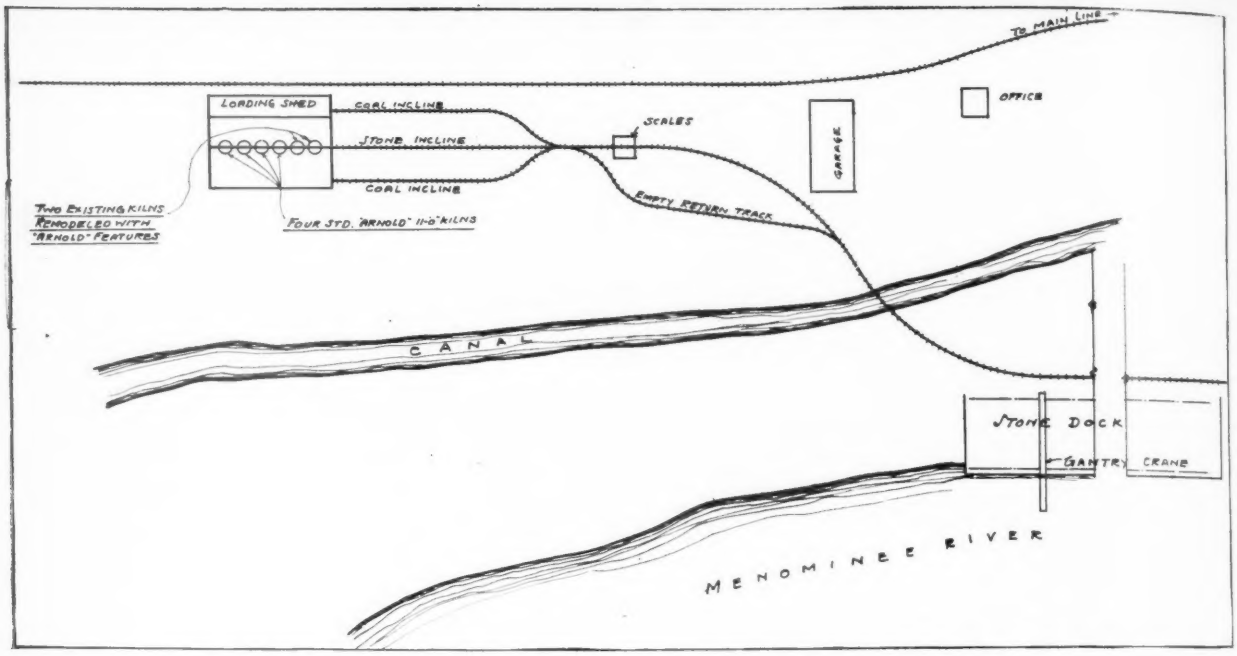
IT sometimes takes a novice to show old timers a few things worth while about their own industry. E. P. Smith, president of the Central West Coal Co., Menominee, Mich., is a novice in the lime business; but he had some good ideas about material handling and efficiency in general, and he has applied them to the operation of a lime plant.

Mr. Smith got into the lime business in 1922 in a small way. His first plant consisted of two kilns designed and built by Richard K. Meade, consulting engineer, Baltimore, Md. He has recently completed and fired his sixth kiln.

As a well-known and prominent local business man, Mr. Smith owned or controlled a number of acres of harbor-front property, where coal and other materials may be put down by boat very cheaply.

Completed plant of the Limestone Products Co., Menominee, Mich., showing both stone and coal inclines

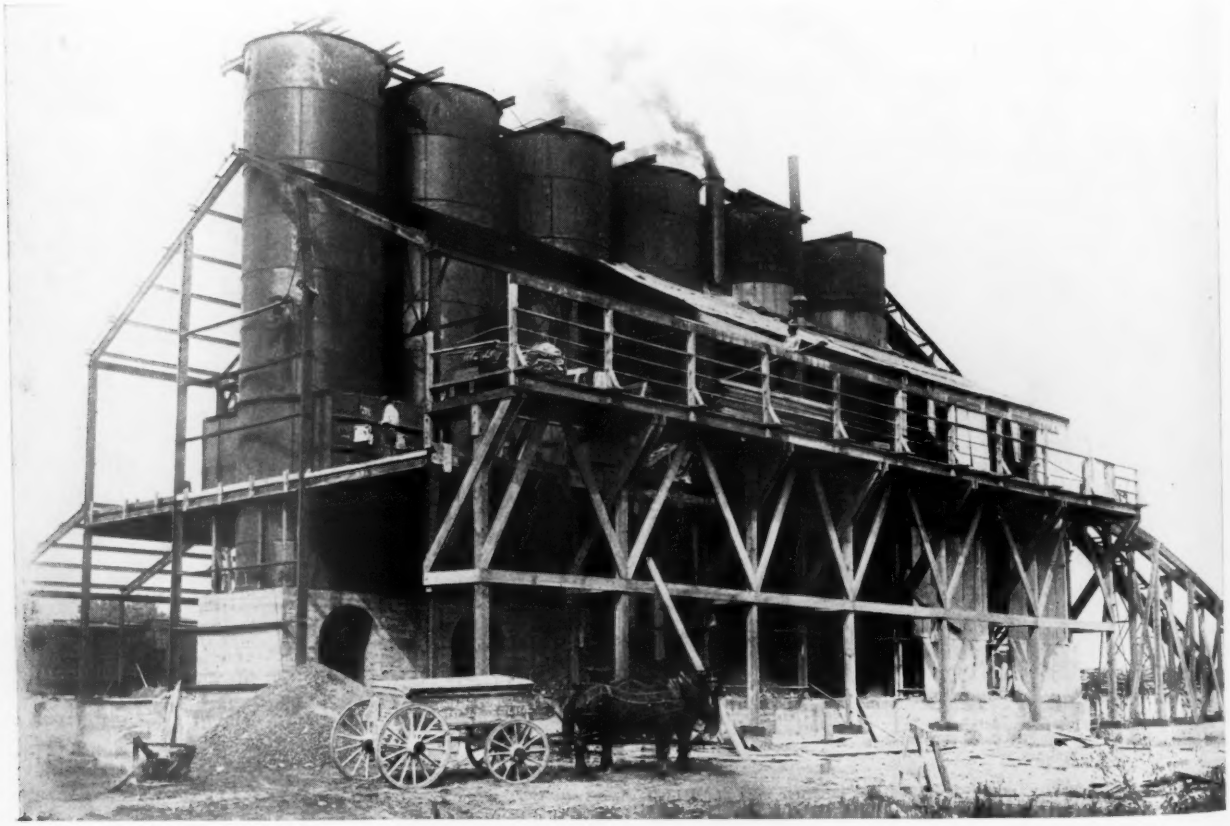
Coal (left) and limestone (right) are unloaded on the waterfront and transferred to cars shown by power shovel



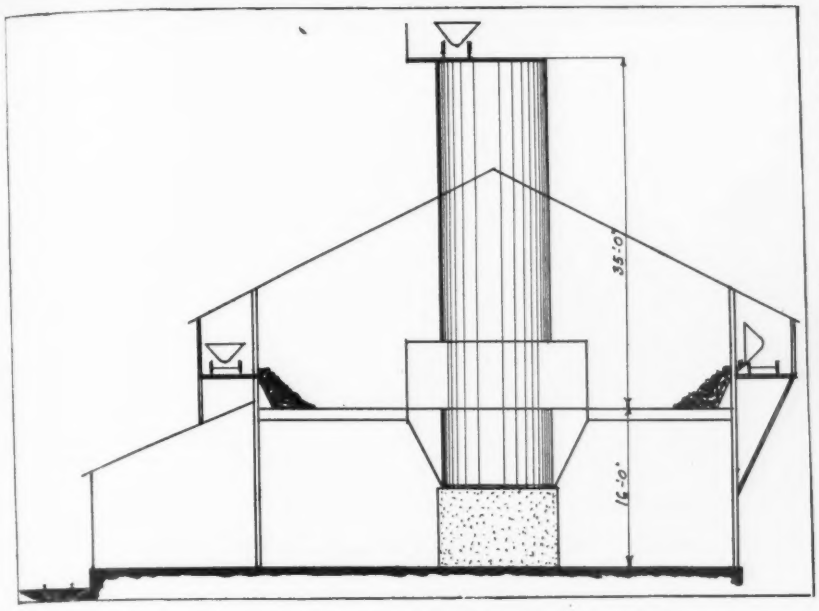
General layout (not drawn to scale) of wharves, lime plant and accessory buildings

Being a coal dealer, he gets supplies wholesale from various sources. He uses mostly run-of-the-mine slack gas coal. Limestone comes from the Michigan Limestone and Chemical Co. operation at Rogers City, Mich., and is a nearly 99 per cent pure calcite.

Both coal and limestone are unloaded by traveling gantry crane into stock piles on the water front. Behind the stock piles runs a narrow gage track to the lime plant, about 1000 ft. distant. A Northwest



Lime plant under construction showing method of supporting structural work about the kilns

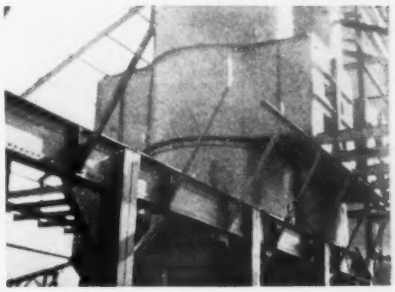


Detail of kiln house and kiln showing coal car tracks on either side

gasoline shovel loads both coal and limestone into 10-car trains of Western rocker-type dump cars, drawn to the foot of the kiln incline by a Plymouth gasoline locomotive. The stone is screened through a gravity bar grizzly before sliding into the cars.

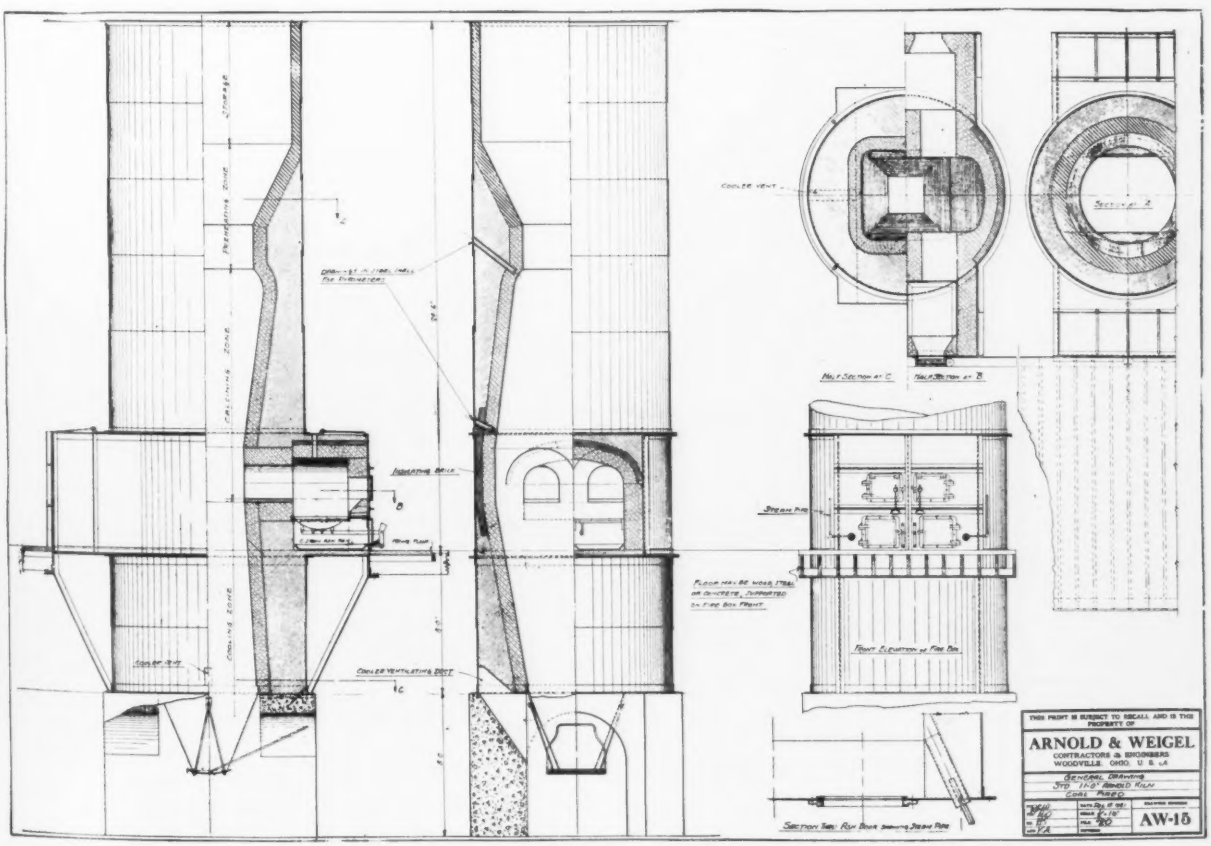
At the foot of the incline is a track scale, where every car of coal and limestone is weighed and recorded, so that the plant superintendent has an accurate check on kiln operation. By this means a fuel ratio of 4 tons of lime per ton of coal has been definitely established, including the coal burned under the boilers.

From the track scale a central track leads to the top of the kilns up a cable-



Detail showing method of carrying structural steel on kilns

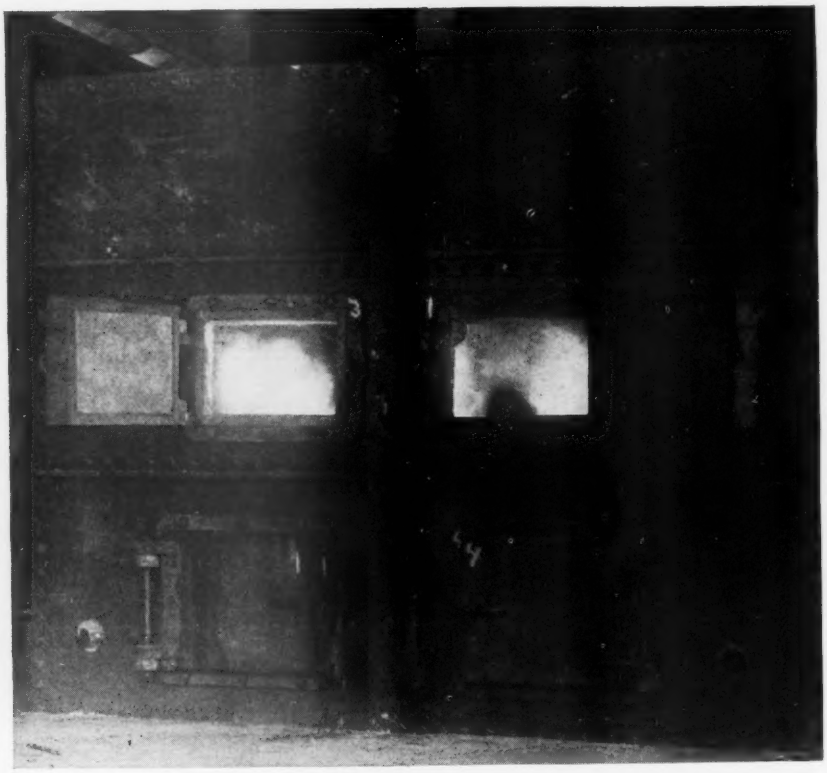
operated incline, an electric hoist being placed and housed at the far end of the kilns. Beyond the track scale, at the foot of the incline, is a two-way switch, operated from the scale house, through which cars of coal may be diverted to either side of the kiln building. These inclines are operated from individual electric hoists at the ends of the tracks. The tracks are



Features of the standard Arnold and Weigel lime kiln with which Menominee plant is equipped

Waterfront of Limestone Products Co. plant

Scale house, both coal and limestone are weighed



Furnace and fire-door construction of kilns

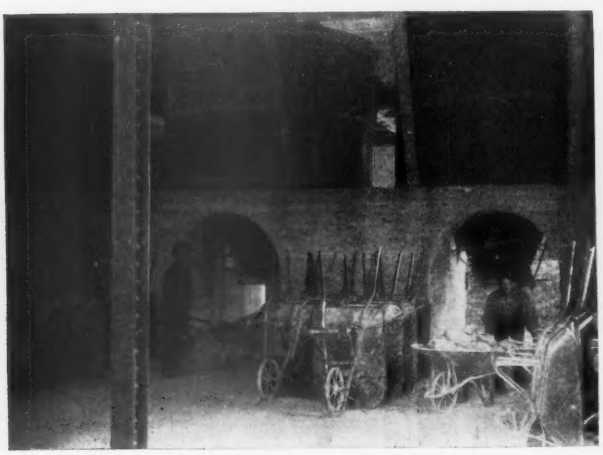
elevated about 3 ft. above the firing floor of the kiln building and dump the coal upon the firing floor within a shovel's length of the kiln fire boxes.

The two original kilns are 12 ft. outside diameter, 51 ft. high over all, with a firing floor 16 ft. above the drawing floor. About three months after they were first fired they were entirely rebuilt by Arnold and Weigel, lime plant engineers and builders, Woodville, Ohio, according to their standard kiln plans (shown herewith).

The four newer kilns were all built and installed by Arnold and Weigel. They are this firm's standard lime kilns, 11 ft. outside diameter, 51 ft. high, with firing floors 16 ft. above the drawing floors. The general layout and the principal features of these kilns are shown in the accompanying plans. Each kiln is equipped with McGinty shaking grates.

These kilns are all lined with the Harbison-Walker Franklin-Crown and Webster firebrick, laid in Thermolith cement (fire arches) and fire clay. They are insulated with Armstrong cork insulation. Incidentally, Mr. Smith recently purchased a sand-lime brick plant at Menominee and has used sand-lime brick for backing with excellent results.

Two small boilers are used to supply steam under the kiln grates, but the amount of steam used, as is the case with most lime plants, is an unknown quantity.



Lime-drawing floor of plant

Firing floor of plant

Lime is drawn in wheelbarrows and allowed to stand until cool

In the short time Mr. Smith has been in the lime business he has developed a demand for his products faster than his ability to meet it. The great bulk of his lime is used for paper and pulp-mill trade in Michigan and Wisconsin.

The editor is indebted to Arnold and Weigel for the general plan and most of the information contained in this article.

Sand and Gravel Production in the Montgomery District, Alabama

THE Montgomery district has been called the greatest sand and gravel center of the country. Just how its production compares with other centers is not known, but the industry there has reached larger proportions.

In that district, which includes Jackson's Lake and Prattville Junction, there are seven operations, and, including the county pit, eight. The value of equipment has been estimated at $1,250,000.

"The sand and gravel strata extends from a point above Chehaw, Ala., on the Western to a point west of Montgomery. The sand and gravel layer on the north side of the Alabama river averages a percentage of sand in the ratio of 6 to 1. The sand and gravel on the south side of the river averages 60 per cent gravel and 40 per cent sand. On neither side of the river is the overburden of unusable earth of such an extent as to make the cost of production of the sand and gravel excessive," says a recent survey.

At Jackson's Lake, about seven miles from Montgomery on the main line of the L. & N., are located the plants of the Kirkpatrick Sand and Cement Co. of Birmingham and of the Premier Sand and Gravel Co., now operated by the Birmingham Slag Co.

The Kirkpatrick Sand and Cement Co. has been operating for 15 years and the present plant is of the revolving screen type, fed by belt elevator. A new plant, however, is being designed, and work on this will be started the latter part of the year. A suction dredge will pump materials to the washing and separating plant on the shore. Besides building sand, a high quality molding sand is also produced. This is known as the Coosada brand of molding sand and has a most extensive market.

The Premier plant, which is operated by the Birmingham Slag Co., was built in 1920 and has a daily capacity of 25 cars. It produces three sizes of gravel and two of sand. The plant is of Link-Belt design, located on 100 acres of land, owned by the company. A Sauerman cable-way excavator operated by 150 hp. Lidgerwood electrical hoist conveys material to the plant.

The Underwood-Walker Co. of Birmingham has its plant at Prattville Junction. A 10-in. dredge, operated by a Fairbanks-Morse semi-deisel oil engine, furnishes sand to the plant, where it is separated by Hummer vibrating screens.

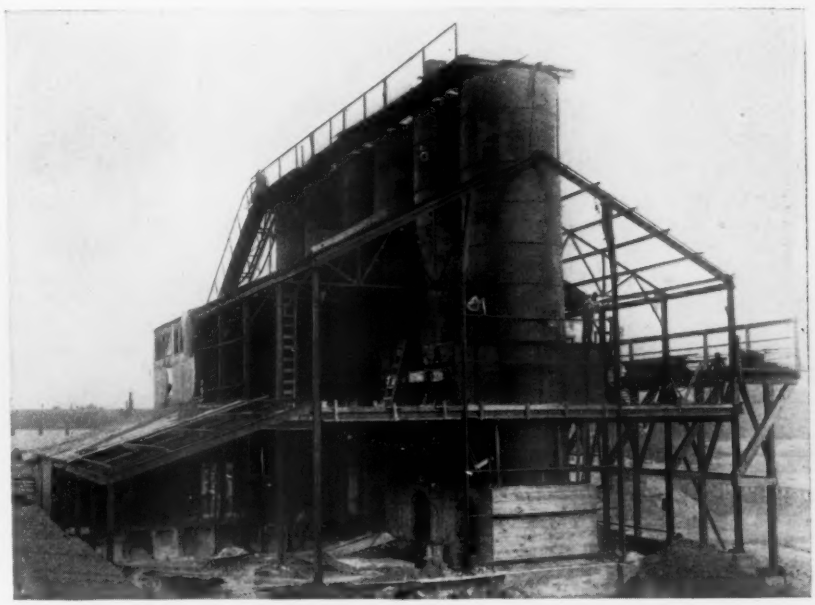
Two other companies have their homes in Montgomery, these being the Alabama Sand and Gravel Co., formerly the Hugger Bros. Sand and Gravel Co., and the Roquemore Gravel Co.

The Alabama Sand and Gravel Co. owns about 1000 acres of sand gravel land. A dredge is operated on the Alabama river and the material is delivered to a loading plant on the shore.

The Roquemore Gravel Co. is a comparatively new producer and is located close to Montgomery, on the Louisville & Nashville railroad.

Other sand and gravel pits in the Montgomery district are those of the Central of Georgia railroad, opened up several years ago on the Connelly property, north of Camp Sheridan; the Mitylene Sand and Gravel Co. of Albany, Ga., now operating the McLemore pit on the Seaboard Airline, and the county pit at Cantelou's Spur.

Most of the plants are served with electricity by the Alabama Power Co.—*Dixie Manufacturer, Birmingham, Ala.*



Another construction view of Menominee lime plant showing detail of structural steel framing of shed and kiln foundations

Sand Company Manufactures Concrete Brick on a Large Scale

The Arundel Corporation, of Baltimore, Md., Forms Arundel-Shope Brick Company, to Manufacture Concrete Brick Under Shope Process—Subsidiary Company a Large Consumer of Sand — Has Had Marked Success

CONCRETE brick is no longer under question as a building material of proved qualities. Tests conducted at leading universities and experiment stations have shown concrete brick to be the equal of clay brick in every respect and, in a great many cases, of even superior qualities. Considered from every structural viewpoint — load-bearing ability, stability, and other considerations— concrete brick have been definitely proved to be a superior building material.

Its efficacy thus having been established, plants for the manufacture of this material have sprung up all over the country where there is a demand for brick. Some of these have been eminently successful and have been a credit to the concrete brick industry; others have been dismal failures and have given the industry a black eye, for much of the success of concrete brick depends upon the carefulness and accuracy exercised in its manufacture.

One of the latest companies to take up the manufacture of this commodity is the Arundel-Shope Brick Co., of Baltimore, Md., a subsidiary of the Arundel Corp., a concern that needs no second introduction to any one connected with the rock products industry. The scope of its operations along the entire Atlantic Coast is too well known to need mention.

The Arundel-Shope Brick Co. has its plant on the site of what is known as the "Brooklyn" sand and gravel storage plant of the Arundel Corp. It buys all its sand from the parent organization and thus forms a considerable outlet for sand for the Arundel Corp. The brick company manufactures concrete brick under the Shope process and is licensed to do business in Baltimore and Ann Arundel counties, Maryland, including the city of Baltimore proper, where, of course, it finds the greatest market for its brick.

Before describing the brick plant something should be said of the Arundel Corp.'s sand and gravel storage and rehandling plant on this site.

Sand and gravel is dredged from the river by continuous bucket dredges and is floated ashore in scows, where it is unloaded with A-frame grab bucket derrick scows into a main receiving hopper which discharges a belt conveyor No. 1.

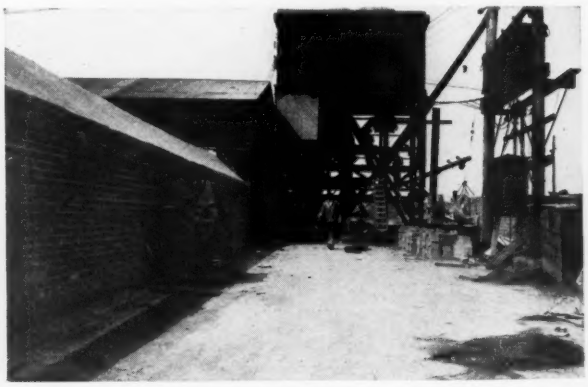
The plant consists of a conveying system of six belts. Belt No. 1, which is 20 in. wide and 300 ft. in centers, parallels the pier and rises to about 45 ft. at the inshore end. The outboard end is level for a distance of about 75 ft. and in this space are placed feeding hoppers and also the discharge from a large rewashing gravel screen. At the inshore end this belt discharges into a vertical chute having outlets leading to Belts Nos. 2 and 3.

Belts Nos. 2 and 3, 20 in. wide and 150- and 400-ft. centers respectively, run at right angles to Belt No. 1 and are on trestle work about 34 ft. above the ground. No. 2 belt is directly above No. 3 and receives the product of a Robins Perfex shaker screen, which is located near and fed from the vertical chute of Belt No. 1. The rejects of the screen pass to No. 3 belt. Both No. 2 and No. 3 belts are arranged to receive the material from the chute or over the screen and discharge into storage by means of automatic trippers. Belt No. 4 is 20 in. wide, 400 ft. between centers and runs in a concrete tunnel which is directly under the storage pile, the top of the tunnel being at approximate ground line. The belt is fed by bin gates and chutes and discharges (in reverse direction of Belts Nos. 2 and 3) to a bucket elevator and also to Belt No. 5. The bucket elevator discharges to a three-pocket truck bin.

Belt No. 5, 20 in. wide and 330-ft. centers, runs outboard on pier, paralleling belt No. 1 and discharges to belt No. 6. Belt No. 6, 20 in. wide, 40-ft. centers, is self-contained in a frame which is mounted on rollers and set at right angles to belt No. 5. This belt is arranged to travel out over the side of the pier for discharge into scows or barges.

The general scheme of the plant was conceived by George H. Bacot, plant engineer for the Arundel Corp., and the drawings, etc., by Richard Morton, engineering contractor, of Baltimore. The entire conveying system was furnished by the Robins Conveying Belt Co., of New York City.

Stiffleg derrick, with 1-yd. grab bucket and 75-ft. boom, unloads sand to ground storage or sand hopper in brick plant



Sand hopper at brick plant. A cement hopper is also provided for in complete plans. Mixers are located underneath hoppers

Brick machines, batch boxes and pallets. The "mud" is brought to the batch boxes in an electric car running on raised platform above batch boxes

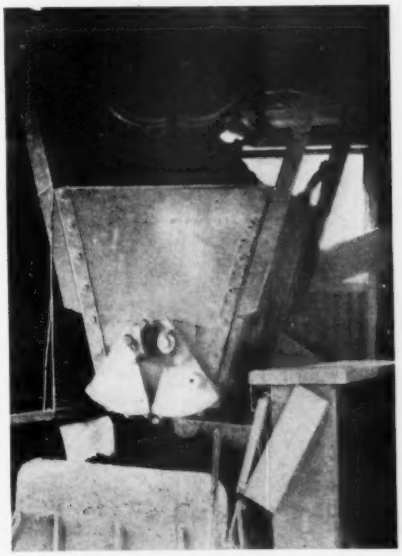
The primary object of this storage and rehandling plant was to provide a storage of sand and gravel for accommodation of reserve stock and excess production with facilities for quick return to barges and scows.

The plant was built in 1920 and has operated continuously winter and summer, up to the present time. During this period the plant has operated successfully and, with the exception of wornout idlers, there has been but little cost for repairs. The original conveyor belts are all in good condition, with the exception of one tunnel belt that will have to be replaced after the current operating season.

While no accurate records have been kept of the amount of material handled, it is conservatively estimated that within the three years, 500,000 tons or more of sand and gravel have been handled. This, of course, is not the full capacity of the plant, but represents the average required to meet the company's conditions.

The brick plant constructed by the Arundel Shope Brick Co. is probably one of the most modern concrete brick plants ever constructed. It is as nearly automatic in operation as is possible. Every device to insure accuracy of measurement in proportioning raw materials for the brick is provided and the facilities for loading and storing brick are admirable. Due foresight has been exercised with a view toward possible expansion.

From the accompanying illustrations and diagrams, the location of the plant with respect to dock, and the like, may be seen. Sand is unloaded from barges and put into ground storage at the dock and adjacent to the plant. This ground storage accommodates 1000 tons of sand which is reclaimed by a stiffleg derrick and 1-yd. clamshell bucket. The sand is put into a 200-ton sand hopper located directly overhead the concrete mixers.



Cut-off valve and measuring box underneath sand hopper

Next to the sand hopper is the cement hopper with a capacity for 25 tons. The material from this bin is drawn out with a screw conveyor and discharged to a batch hopper overhead the concrete mixer. The sand hopper is fitted with a cutoff valve and a batch hopper, also discharging to the concrete mixer. Water is automatically added from an overhead tank, and with the arrangement of the batch hopper an accurate mix is assured. There are two 14-ft. Blystone mixers for concrete mix and one 7-ft. Blystone mixer for preparing facing material.

The concrete mixers discharge to an electric car, with an inverted V-type body, discharging on either side. The car holds ¼ yd. and runs on a platform overhead the batch boxes which are placed near the brick machines. The batch car is of the company's own manufacture and has a continuous running 5-h.p. motor, limit switches at either end and an overhead trolley. The time consumed in making a complete trip is less than a minute. This device has replaced several men who formerly wheeled the "mud" in wheelbarrows to the batch boxes, let alone the increase in efficiency.

At the present time the company has 19 brick machines, one tile machine and one side facing machine. These are all Shope patented machines and are located on both sides of the car platform. The machines are hand operated.

The man at the tamping machine takes the mix from the batch box at his side and fills the molds. The bricks are made face up, and after thorough tamping the surplus material is struck off. The operator then adds the correct amount of water and color to the face of the brick, which he thoroughly agitates and works into the body by means of a float made especially for that purpose. This operation gives the brick a base color and creates a density

The storage yard, showing locomotive crane for handling common brick

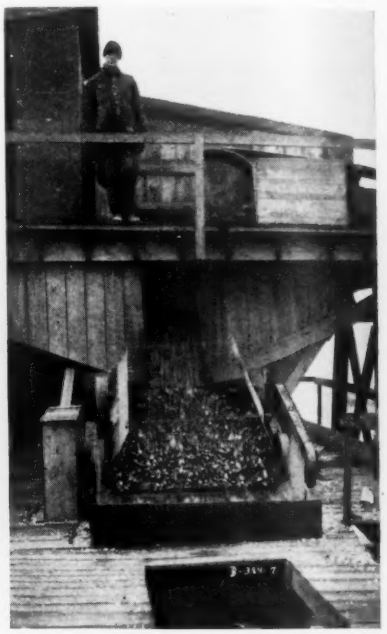
View of water front and sand and gravel storage rehandling system

Storage of sand and gravel under belts Nos. 3 and 4. Belt No. 5 is in the reclaiming tunnel underneath storage pile Automatic trippers on belts Nos. 3 and 4

of from 5/8 in. to 1½ in. in the body of the brick, so that when the brick is laid up with a stripped or a rodded joint it will be impervious to water. The finishing color is then applied and worked into the base color through a stippling process for a tapestry finished brick and with various other finishing tools, where other patterns are desired. The application of the finishing color completes the waterproofing process.

After the brick have been "slicked" the operator lifts them from the machine by a rack and pinion arrangement which leaves the pallet on the machine free. He places this pallet directly behind him from where it is taken and conveyed to the kiln or steam curing rooms. Only two off-bearers

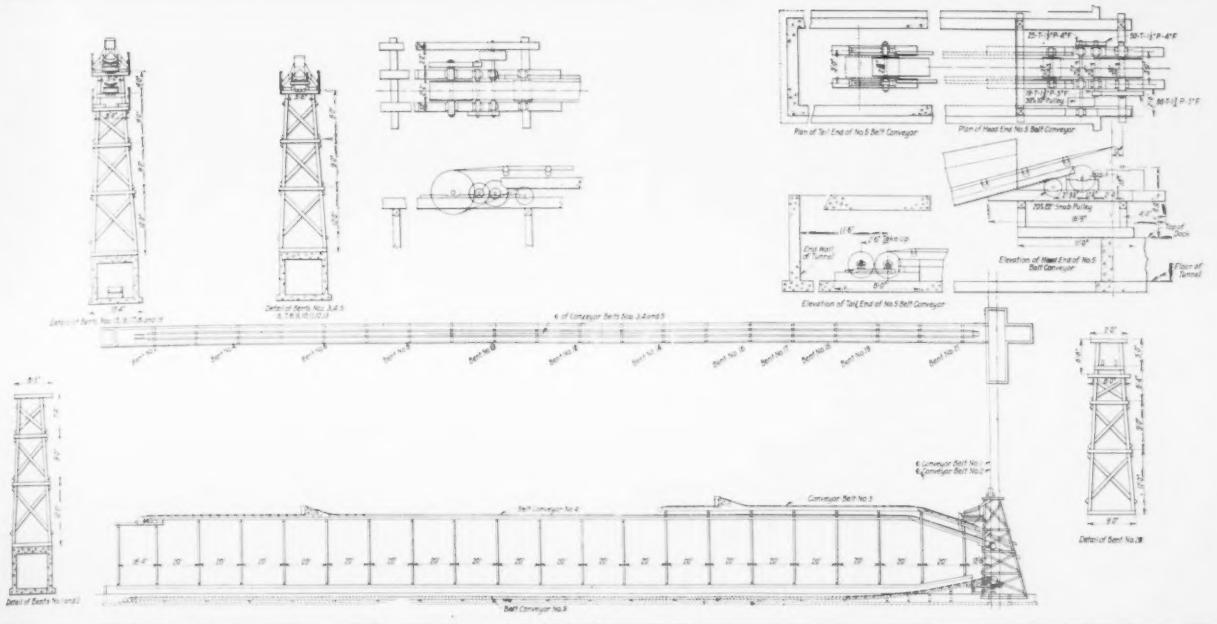
Kiln or steam-curing rooms. There are 11 of these, 8x72 ft. Note bearer with off-bearing truck entering kiln



Shaking screen from belts Nos. 1 and 2 depositing to belts Nos. 3 and 4. Two separations in sizes are made

Another view of conveyor belts Nos. 1 and 2

Derrick unloading sand from scow and depositing to loading hopper feeding conveyor belt



Elevation and details of conveyor

with Shope "tired" trucks are required for all the machines.

The kilns, of which there are 11, are 8 ft. wide and 72 ft. long, of Ideal hollow wall construction. A perforated steam pipe in a trough is located in the wall. When curing brick the steam escapes into the kiln from vents in the wall. A water pipe is also located at the top of the kiln and when necessary throws a vapor spray over the brick. The system is such that brick can be cured at an even temperature regardless of climatic conditions. Ordinarily brick are cured for 36 hr. under a temperature of 110 deg. Fahr.

After curing, four men take the brick out of the kilns and truck them to the storage yard. At the time of the writer's visit, an industrial track system, as shown in the accompanying sketch, was being installed. The brick are discharged on a flat deck steel car holding 500 brick and the car is pushed to any part of the yard. Turntables are provided for transfer wherever necessary. It is estimated that 4,500,000 brick can be stored in the yard.

A Browning locomotive crane is located

Conveyor belts Nos. 1 and 2. The old screening plant is shown in extreme right

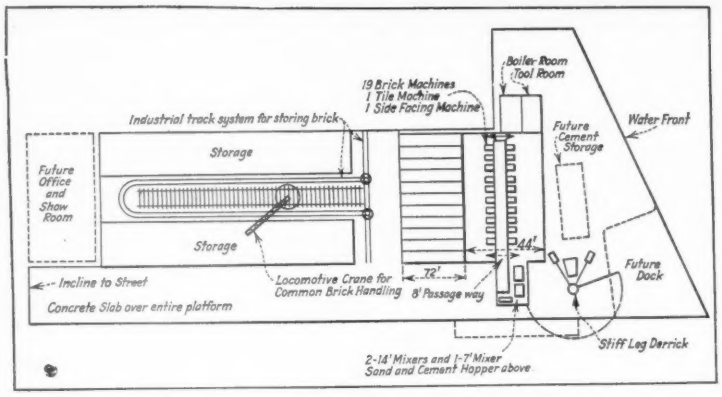
Junction point of conveyor belts Nos. 1, 2, 3 and 4. Truck-loading bins at left

in the center of the yard and is used for loading common brick into trucks. The crane has specially designed grappling hooks which lift 500 bricks at a time, the capacity of one flat car, and deposit them into waiting trucks or distribute them into storage. The system is very flexible and one that insures rapid loading.

A 50-hp. boiler is provided for furnishing steam for the curing rooms. All other machinery is electrically operated.

At the time of the writer's visit the plant was turning out 60,000 brick, common and face. With improvements that are being made, the capacity will be brought up to 100,000 brick daily.

The Arundel-Shope Brick Co. started operation on September 22, 1922. They went after municipal work immediately and on March 3, 1923, they had already delivered 400,000 brick and had orders on their



Layout of industrial railway at storage yard

books for 8,000,000 more.

The Arundel-Shope Brick Co. runs tests on its brick at least twice a month. Frequently tests are run at such universities as Johns Hopkins and Columbia and the results are always broadcasted to architects and builders.

Daily tests are made of sand and cement used for concrete mix. No cement or sand is released for manufacture unless it has been teste dand approved.

L. L. Wagner is president of the Arundel-Shope Brick Co.; R. A. Wagner, vice-president; and Richard A. Froehlinger, secretary-treasurer. L. L. Wagner is responsible for the design and erection of the plant.

Lime in Glass Making

By R. R. Shively, Ph.D.
Chief Technologist of B. F. Drakenfeld & Co., New York

ALL three forms of lime, burned, hydrated and raw, are used in glass. Each form has its advantages and likewise its advocates and it is the idea of this article to discuss in a general way the merits and objections to each.

Before entering upon the main discussion it seems advisable to give briefly the function of lime in glass. Lime is the cheapest flux available and in the soda lime glasses, that is, window glass, bottles, jars, etc., it has the property of reducing the solubility of the glass. The solubility decreases as the lime increases, or in other words the glass becomes more durable as the lime increases. The percentage of lime in bottles and jars is from 6 to 12 per cent, in window glass from 12 to 16 per cent. Glasses have been made containing as high as 25 per cent lime, but these devitrify badly and are not considered good glasses.

In the writer's opinion, glass should contain, where durability is desired, not less than 8 per cent lime and it is advantageous to have between 1 and 2 per cent of alumina present, which aids in reducing solubility and helps in preventing devitrification.

It might be well to note here that high calcium and dolomitic limes are both used in glass, and that each has its advocates. However, the merit of these limes will not be taken up here, as this subject would furnish material for a paper within itself.

Raw lime is used almost exclusively in window glass and some is used in making flint glass for bottles and jars. Its advantages are that it is the cheapest form of lime, it is less objectionable to the workmen in handling and it is constant in composition. Its chief disadvantages are that it contains organic matter which is objectionable for flint glass, unless some salt cake, nitre or other oxygen carrying material is added to the batch to eliminate the carbon. It is also the writer's opinion that the rock is not as carefully selected as that which is burned and that there is greater difficulty in obtaining raw limestone low in objectionable material than in securing satisfactory burned lime.

Theoretically, a limestone batch requires more heat to flux than one made of burned lime. However, when it is considered that not over 10 per cent of the heat introduced in a glass furnace is really utilized in melting the glass, this is not as important as it seems. In fact, certain investigators claim to have found that a limestone batch melts better than burned lime and attribute it to the escaping carbon dioxide from the limestone, which they claim gives more agitation and speeds up the fining of the glass.

Burned lime is used in most instances where good color is desired. This is true because it is possible to secure burned lime containing less than 1/10th per cent iron and free from organic matter. In the past year a great stride forward has been made by the producers of burned lime. Certain manufacturers are now determining the loss on ignition on each car as shipped and sending these results to the consignee. This work has been handled by the National Lime Association and has been of great help to the glass manufacturers. Burned lime with an ignition loss of less than 3% is now easily obtainable.

The chief objections to burned lime are its unconstant composition, its increased cost and its being unpleasant to handle. But the writer prefers it and his experience is that more glass can be melted where it is used than when either of the other forms are used.

Hydrated lime is used very little in glass manufacture. Its chief advantage is constancy of composition and it is the purest form of lime, but its greatly increased cost makes it undesirable.

The Bureau of Standards has published specifications for various forms of lime for glass making, but on account of the varied glasses and the different size of furnaces it is difficult to give complete specifications. The important thing is uniformity and when a manufacturer gets accustomed to a lime there should be no great variation in subsequent shipments. The following general specifications are proving satisfactory:

Grinding: Limestone is used in sizes from 100-mesh up to pea size, depending upon the conditions under which it is used. In the larger furnaces coarse stone is usually employed.

Burned Lime: Should all pass a 20-mesh screen.

Hydrated Lime: Is always fine enough.

Alkaline Earths: Limestone should contain not less than 93 per cent calcium and magnesium carbonates. In burned lime the calcium and magnesium oxide should not be less than 90 per cent.

Iron: In general, the iron content should not be over 0.1 per cent Fe_2O_3 based on limestone.

Sulphates: Some object to the presence of sulphates, but the writer does not. There should be no great variation in different shipments.

Silica and Alumina: These substances are not objectionable, but there should be no considerable variation in different lots.

Frequently glass manufacturers lay their troubles to glass making materials, and as sand and soda ash are both supplied in extremely pure forms, lime receives more blame than anything else. Experience leads the writer to believe, however, that the larger part of the troubles are due to furnace conditions, usually lack of heat.

In closing it seems fitting to say that, to the writer's knowledge, the National Lime Association has been tireless in its efforts to assist glass manufacturers.

Constitution of Portland Cement

11—Second of a Series Which Gives the Newer European Developments in the Chemistry of Portland Cement

By J. L. Duchez
In the Revue des Materiaux de Construction et de Travaux Publics

Translated by C. S. Darling
Formerly Editor of Rock Products

IN the first of this series the sum of the silica, alumina and lime contents of cements, found by an average of molecular analyses, was given as 3.84 SiO_2+99Al_2O_3+11.96CaO. It is this formula which we advised M. Coutal, in 1920, to use for the proportioning at Rochefort, simplifying it by bringing the coefficients to the nearest whole numbers: 4SiO_2+1Al_2O_3+12CaO (*1) which corresponds to the approximate formula: 4($SiO_2$2CaO)+$Al_2O_3$3CaO (*2).

This formula had already been noted in 1910 by Professor Keisermann of the University of Jéna. It is lower in lime than Mr. Hendrickx's formula, which errs similarly on the opposite side. Is it better to have a richer lime content and write the formula $SiO_2$2.5CaO or to have a richer silica content and retain $SiO_2$2CaO? We believe that on this particular point discussion is unnecessary, as the errors in manufacture under actual conditions will soon have outweighed the difference.

Bicalcium Silicate

If we accept the formation of the bicalcium silicate and the tricalcium aluminate, the 3.84SiO_2 will require 3.84×2=7.68CaO and the .99Al_2O_3 will require .99×3=2.97 CaO, or a total combined lime of 7.68+2.97=10.65CaO, leaving 11.96—10.65=1.31 free CaO. The cement thus obtained would have a formula:

3.84($SiO_2$2CaO)+.99($Al_2O_3$3CaO)+1.31CaO

If we accept the formation of the tricalcium silicate $SiO_2$3CaO, the 3.84SiO_2 will require 3.84×3=11.52CaO and there will remain 11.96—11.52=.44CaO available to combine with the .99Al_2O_3. The coefficient of the alumina being .99, that of the lime would be $\frac{0.44}{0.99}$ = .44, and the formula of the aluminate obtained Al_2O_3.44CaO, therefore much less basic than the tricalcic aluminate, and even less basic than the bicalcic aluminate accepted by Newberry. The cement thus obtained would have as its formula: 3.84($SiO_2$3CaO)+.99(Al_2O_3.44CaO)

We have remarked that the cement considered has a very high magnesia content, corresponding to the more magnesian cements of M. Candlot's table, given in the first of this series. We may remark also that for cements with 23 per cent of silica this same table indicates lime contents of 62 to 63 per cent. The accepted amounts of alumina and iron remain within the average.

Confirming Jordan and Kanter

Now if we decrease the amount of magnesia in the cement considered, the amount of lime in our calculations will decrease, since we have considered the magnesia as lime. If we accept the presence of bicalcic silicate $SiO_2$2CaO there will still remain sufficient lime to form the tricalcic aluminate $Al_2O_3$3CaO, but the free lime will decrease and tend to disappear. This seems, nevertheless, to confirm the experiments of Jordan and Kanter so far as the presence of a small quantity of free lime in the cements is concerned.

If we accept the presence of the tricalcic aluminate in the cement considered it becomes materially impossible to form the tricalcic silicate, the remaining quantity of lime being insufficient. It is no longer possible to form anything but the silicates approaching the bicalcic, as we as well as M. Hendrickx noted, or the bicalcic silicates if we accept the presence of the free lime in the cement. This supports the experiments of Day and Schepard which deny the existence of tricalcic silicate in cements.

Finally, if we wish, in spite of everything, to accept the presence of tricalcic silicate as the principal constituent, it is absolutely necessary to admit that the aluminate entering into the constitution is something besides tricalcic aluminate either considering a portion of the silica in the cement as free, or inversely that besides the tricalcic aluminate there will remain some uncombined alumina (*3).

Cements Basic Compounds

Cements are basic compounds and it must be accepted that they include at the same time silicates of lime and aluminates of lime. That is to say, the alumina acts as an acid and not as a base.

The different formula actually in use for the proportioning of materials for making low fusion cements are the following:

1. Michaëlis, $M = \frac{CaO}{SiO_2+Al_2O_3+Fe_2O_3}$
2. Newberry, $x(SiO_2 3CaO)+Al_2O_3 2CaO)$
3. LeChâtelier, $x(SiO_2 3CaO)+(Al_2O_3 3CaO$

We shall add the one which we recommend:

$x(SiO_2 2CaO)+(Al_2O_3 CaO)$

and we shall study the cements constituted according to the different formulas of raw materials of the same composition.

With the formulas which we recommend the maximum saturation of lime in a cement would be

$$\frac{SiO_2}{60}\ \frac{2CaO}{112} + \frac{Al_2O_3}{102}\ \frac{3CaO}{168}$$

which gives the proportion of lime to silica as $\frac{112}{60}$ = 1.85, and of lime to alumina as $\frac{168}{102}$ = 1.65

We shall borrow the analysis of raw materials from M. Leduc's book, "Limes and Cements," page 139:

Materials	Limestone Per cent		Clay Per cent	
Silica	2.50		57.70	
Alumina	1.40	2.50	17.20	25.50
Iron	1.10		8.30	
Lime	53.00	53.20	1.40	3.80
Magnesia	0.20		2.40	
Sulphuric acid			1.60	
Alkalis			3.30	
Loss, ignition	41.80		10.10	

*1. We had similarly indicated this molecular composition in a report to M. Espinasee, director general of the factories Saut-du-Tarn, for the proportioning of cement from slag in 1917, and in 1919 to M. Gaillard of the Forces motrices de l'Algout for proportioning fused cement with the probable necessary addition to the alumina content by the addition of bauxite to obtain more fusible products. The fused cements were in their beginning;—and I should recognize that M. Espinasse, by the discussion of my 1917 report, and without being aware of M. Bied's studies, had already opened up to me new horizons on the composition of cements, or better on the nature of the constituents. I recall experiments on time of set on old non-granulated slags of composition identical with those which M. Died cites, and which M. Espinasse indicated to me as giving normal set. M. Le Carme, chemist at Saut-du-Tarn, had also talked with me, at that time, of the set of aluminous cements.

*2. Exactly 4(SiO_2 2CaO)+Al_2O_3 3CaO+CaO or 4(SiO_2 2.25CaO)+Al_2O_3 3CaO.

*3. M. Le Carme, engineer-chemist at Saut-du-Tarn, had this same idea in 1917. He described to me at that time several facts confirmed by examinations under polarizing light, confirming experiments since made which we present in the study of aluminates.

We give in the table below the chemical composition of the cements obtained with the four formulas indicated above:

Formulas:

Parts Limestone Per 100 Parts Clay

Michaëlis	380.00
Newberry	390.19
Le Châtelier	407.46
Recommended	279.63

We could evidently accept the formation of the double silicate of alumina and lime by considering the alumina as a base instead of an acid. Zulkowski has shown that compounds of this sort cannot exist if the degree of saturation of the clinker is less than unity (the relation between the number of basic molecules and the number of acid molecules is thus denoted). When, on the contrary, the silica-alumina mixture with lime admits of a proportion of lime such that the degree of saturation becomes greater than unity, we no longer obtain the double silicate of alumina and of lime, but a silicate and an aluminate of lime.

Chemical composition of resulting cements:

	Per cent			
SiO_2	21.00	20.64	20.19	22.80
$Al_2O_3+Fe_2O_3$	11.20	11.11	10.71	12.01
$CaO+MgO$	66.20	66.68	67.27	63.30
H_2So_4	0.50	0.50	0.49	0.60
Alkalis	1.00	1.04	1.01	1.18
Totals	99.97	99.97	99.67	99.89

The molecular formula of the cement obtained with the recommended formula would be the following:

$$3.8(SiO_2)+1.17(Al_2O_3)+11.30(CaO)$$

which gives

$$3.8(SiO_2 2CaO)+1.17(Al_2O_3 3CaO)+.19CaO$$

or

$$3.8(SiO_2 2.5CaO)+1.17(Al_2O_3 3CaO)$$

This comes back exactly to the formula of M. Hendrickx in this particular case.

If we examine agan the table gven by M. Candlot we find, out of 53 cements, 38 having a silica content above 22 per cent and only five with a silica content below 21 per cent. There are 34 cements below 63.5 per cent and only five more than 66 per cent lime, including the lime and magnesia together. However, these cements have not been chosen with the majority, with which it is impossible to reconstruct the formula:

$$SiO_2 3CaO+Al_2O_3 3CaO$$

At all events it is possible to manufacture good cements with the formula:

$$4(SiO_2 2CaO)+Al_2O_3 3CaO$$

where the relation $\frac{\text{Base}}{\text{Acid}}$ is equal to $\frac{11}{5}=2.2$ and which represents, in our opinion, the lowest limit to be accepted for cements from incipient fusion (*4). The relation of $\frac{\text{Base}}{\text{Acid}}$ which is closest to the formula deduced from the average of the cements of M. Candlot's table would correspond to:

$$\frac{CaO+MgO}{SiO_2+Al_2O_3+Fe_2O_3}=\frac{12}{5}=2.4$$

This changes nothing in the principles of M. Le Châtelier who, in his book, "Constitution of Hydraulic Mortars," writes as follows:

"In my memoirs of 1887 I indicated two formulas defining the limits between which a good portland cement should occur. The proportion of lime, calculated in equivalents, must be under three times the sum of the quantities of silica and alumina calculated similarly in equivalents. The lime in excess of the amount thus indicated remains free and gives rise to the too well-known accidents from expansion.

$$\frac{CaO}{SiO_2+Al_2O_3}$$ is equal to or less than 3,

the iron being counted with the alumina and the magnesia with the lime."

The formula which we recommend and that of M. Hendrickx fulfill the condition.

$$\frac{CaO}{SiO_2+Al_2O_3}$$ is less than 3

and consequently does not attack the higher limit of the lime content indicated by M. Le Châtelier.

On the other hand, the proportion of lime must be greater than three times the difference between th quantitis of silica and alumina, calculated always in equivalents. This is to avoid the formation of dicalcic silicate.

The formula which we recommend and that of M. Hendrickx agree again to this condition. The difference between silica and alumina is equal to $4-1=3$ which, multiplied by 3, gives 9. The lime content being 11 at the minimum is greater than three times the difference between silica and alumina.

M. Le Châtelier says concerning this lower limit for the lime content:

"So far as the lower limit of the lime content is concerned the one I had indicated is much too low; a large proportion of dust is obtained before reaching that limit."

The formulas are all higher in lime than 9 and consequently conform in all points to the theory of M. Le Châtelier. We shall remember only that the closer the relation $\frac{\text{Base}}{\text{Acid}}$ approaches 3, the more risk of expansion, and that the closer the lime content approaches $3(SiO_2-Al_2O_3)$ the greater danger there is from the presence of the dicalcic dust.

We shall study in the following instalment the different constituents of the cements formed by fusion or by incipient fusion and the manner in which they act in the presence of one another.

(To be continued)

*4. Blast furnace slags from Saut-du-Tarn with index $\frac{\text{Base}}{\text{Acid}}$ much below 2 have given (resistances a la traction) corresponding to very good administrative hydraulic limes without noticeable increase in strength after the addition of hydrated lime. But these are products of complete fusion.

Portland Cement from Oyster Shells

THE plant of the Texas Portland Cement Co. at Manchester, Texas, is located on the Houston ship channel approximately seven miles from the city of Houston. It is the only cement plant in the United States using oyster shells for its lime constituent. Contrary to general belief all cement is not manufactured from what might be termed "cement rock."

Dr. M. E. Holmes Joins Staff of the U. S. Gypsum Co.

DR. M. E. HOLMES, who recently resigned as director of the chemical department of the National Lime Association, is now development engineer in charge of research of the U. S. Gypsum Co., with headquarters at 205 West Monroe street, Chicago, Ill. This does not mean, according to the editor's interview with officials of the U. S. Gypsum Co., that this company contemplates any special research work in lime, but merely that it can make good use of Dr. Holmes' special ability in research work in carrying on its development of gypsum products for which this company has been famous.

Dr. M. E. Holmes

The U. S. Gypsum Co. recently leased the plant of the York Valley Lime and Stone Co., York, Pa., and is installing a hydrating plant there. No addition to the 12 kilns there is contemplated at the present time. This is a high calcium lime. The York plant was added to the U. S. Gypsum Co.'s operations, the editor was told, in order to better serve the company's regular dealers.

Use of Lime in Petroleum Refining

Lime and Chlorine Supersedes the Acid Process, Claimed to Give a Better Color and Odor and a Lessened Loss in Refining

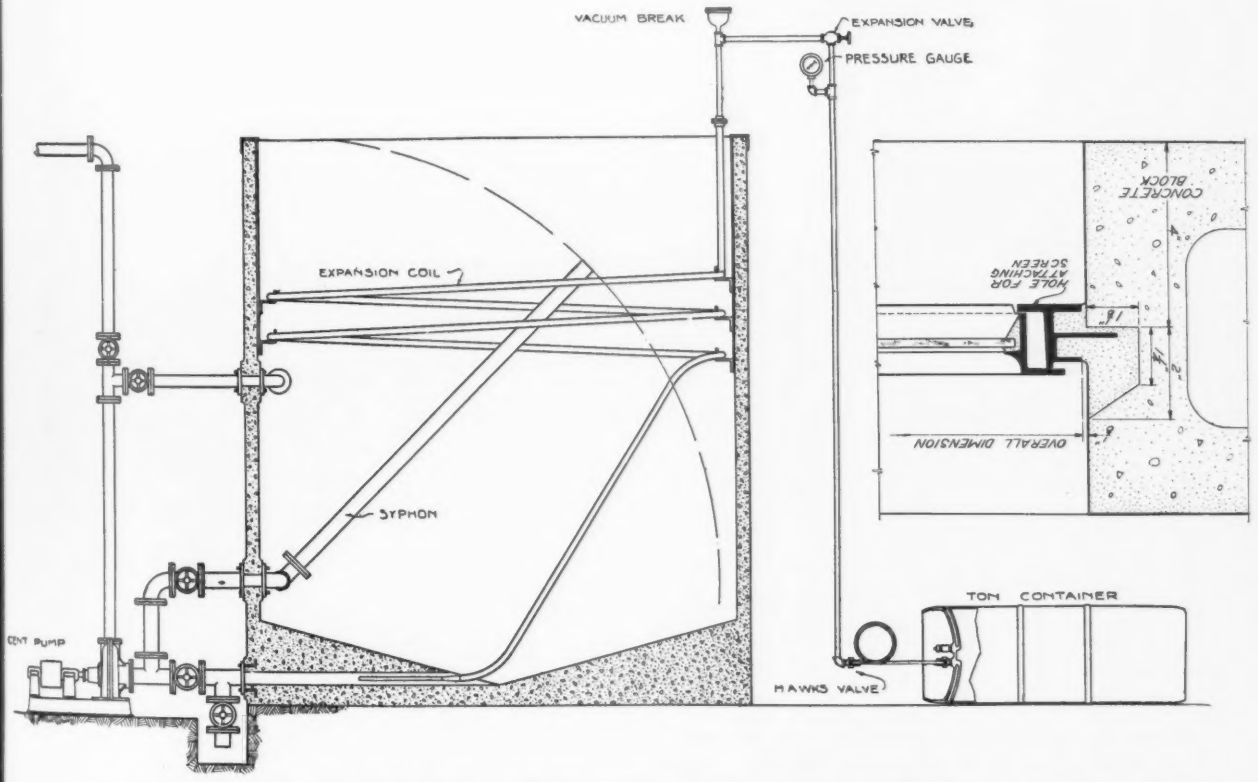
By Benjamin T. Brooks
Chemical Engineer, with Mathieson Alkali Works, Inc.

PROBABLY the majority of petroleum refiners use hydrated lime in water softening. The same product, in the convenient 50-lb. paper bag package, is recommended for use in preparing hypochlorite solutions for gasoline refining. Not only is this form of package easy to handle, and practically any weight of lime obtainable by merely counting the number of bags, but hydrated lime is more reliable in composition than most grades of commercial quick lime.

The preparation of solutions of calcium hypochlorite solutions, often called simply "bleach liquor" in the paper pulp industry, has been reduced to a very simple procedure. To make such a solution it is imperative that sufficient lime be used so that when all the chlorine has been passed in, a slight *excess* of lime will be present and that the solution be alkaline. Since liquid chlorine is furnished in accurately weighed quantities, in steel containers, all that is necessary is to instruct the workman to use a definite amount of water, a certain number of sacks of hydrated lime and allow the chlorine to pass in until the container is emptied. The excess lime is then permitted to settle out and the fairly clear liquor then drawn off.

The accompanying sketch shows a method, developed by the Mathieson Co., which has given entirely satisfactory results. The centrifugal pump is for the purpose of keeping the lime in suspension and the chlorine gas is discharged into the intake of the pump, as shown, at a rate such that all of the gas is absorbed without "racing" the pump. One ton of chlorine can be absorbed in this manner by a centrifugal pump rated at 600 gal. per minute in about 2½ hr. It will be noted that the chlorine passes through a coil hung on the wall of the tank. This is for the purpose of evaporating the liquid chlorine, the ordinary temperature of the tap water being quite sufficient for this, and since there is a certain heat of reaction of the chlorine and lime, the cooling effect on the solution effected by evaporating the chlorine in this way is of decided benefit. Formerly it was frequently the practice to evaporate the liquid chlorine in a special steel evaporator, heated by steam or hot water.

The present system gives a safe and even flow of gas and workmen accustomed to ordinary gas pipe fitting can make the nec-



Section through machine for mixing lime and liquid chlorine. The chlorine is introduced into the pump suction, after expanding in the coil, and pumped into and out of the tank

essary connections so that there is never any odor of escaping chlorine gas.

The sulphuric acid method of refining gasoline, almost universally used heretofore, involved agitating the gasoline with about 3 to 9 lb. of sulphuric acid per barrel, depending upon the purity of the unrefined gasoline and the degree of refining desired. In this treatment the acid takes up some of the impurities and also some of the oil itself to form a more or less viscous or oily "sludge acid," which is drawn off and must then be partially recovered by diluting with water to precipitate the oil and tars and reconcentrating the dilute acid by evaporation. Many small refineries do not have acid recovery plants. The acid oil and tars separated from the sludge are usually burned or dumped in sumps or ponds. Its disposal is sometimes a serious problem. Another feature of acid refining which is sometimes a source of trouble is that the acid wash water if discharged into small streams contaminates them to an objectionable degree.

Objections to Acid Refining

Sulphuric acid removes a large part of the malodorous compounds and some of the sulphur compounds, but acid treatment must invariably be followed by the usual water and alkali washing and then by agitation with alkaline litharge or sodium plumbite solution. This further improves the odor, but to cause the lead precipitate to form properly it is usually necessary to add sulphur. Gasoline so refined is frequently corrosive to copper (one of the common tests), and also is not as stable as gasoline refined by hypochlorite. Hypochlorite refining gives a gasoline which is entirely "sweet" to alkaline plumbite solution, which is a legal requirement in some states. It is also much more rapid in its action than alkaline plumbite.

The hypochlorite method has been installed in refineries that formerly did not use sulphuric acid on gasoline, but only alkaline plumbite.

The refining operation itself can be carried out in standard type equipment, either of the batch agitator or continuous treatment type.

Probably the greatest advantage of the hypochlorite method over the acid method is the elimination of the acid tars above referred to and the consequent reduction of the treating losses. This will be evident by merely stating the fact that cracked pressure distillate has been treated on a very large scale in enclosed apparatus of the continuous type with a treating loss of 0.25 per cent. On this type of distillate the directly observed *acid* refining losses run from about 1.25 per cent upwards. It is also frequently noted that gasoline refined by sulphuric acid in the usual manner goes off color on storage unless redistilled after refining. This is particularly true of high sulphur gasoline which has to be treated with large amounts of acid, and cracked gasolines also give this result, so that redistillation after refining is the usual practice with gasolines of this type. With certain types of cracking apparatus it is possible to obtain a cracked gasoline distillate of the proper boiling point range and good color directly from the cracking stills. Such gasoline has a bad odor and contains impurities which cause it to become discolored on standing. It has been the custom to refine such gasoline by alkaline litharge without acid treatment, but it has recently been shown that when refined by hypochlorite such gasoline is much more stable with respect to color than when refined by the alkaline plumbite method.

Developed in Persia

The hypochlorite method of refining gasoline was first developed and used on a large scale by the Anglo-Persian Oil Co., the method having been investigated and perfected in their plants under the supervision of Dr. A. E. Dunstan, a well known authority on petroleum technology. It has since been applied on a large scale to a wide variety of American gasolines, including light natural gas gasoline, straight run gasoline distilled direct from the crude oils and also cracked gasolines. In certain cases cracked gasolines which are highly colored can best be refined by hypochlorite followed by a very light modified acid treatment, the net result of which is to reduce the acid requirement to about one-eighth the usual amount, with corresponding decrease in the treating losses, together with increased stability or keeping qualities.

The refinements of the method, as well as the fundamental operation of treating with dilute alkaline hypochlorite solution, are covered by a series of patents, issued and pending, which are controlled in America by the Mathieson Alkali Works.

Tennessee Commission Orders Lower Rates on Road Material

THE Tennessee railroad and Public Utilities Commission issued orders today for hearings on September 4 of two cases involving rates on sand, gravel and slag and road material on complaints lodged with the commission against the published tariffs of the N., C. & St. L. railway. One of these orders cites the railway to show cause why it should not reduce its rates on sand, gravel and slag moving intrastate in Tennessee so as not to be any higher than 112½ per cent of the rates in effect upon these commodities on July 29, 1920.

The other order cites the railway to appear on the same date to answer for disregarding a previous order by the commission regarding lowered rates on highway material. The commission, in effect, declares that the railway is in contempt for disregarding an order reducing the rates on the materials named.

The commission, in its order issued today, suspends the tariffs as now charged by the railway and orders the lowered rates made in a previous order reinstated. The new order comes as a sequel to a recent decision of the United States Supreme Court holding the rate schedules were proper. The rate allowed was 112½ per cent higher than those in effect July 29, 1920.—Nashville, Tenn., *Banner.*

Pennsylvania Farmers Hold Limestone Day

INDIANA, Pa., Aug. 31.—Sixty-seven carloads of Michigan limestone in one single train, the largest shipment of its kind ever made, reached here today. The arrival of the shipment, which was consigned to 50 local farmers, was part of the "Limestone Day" celebration held here today under the auspices of the County Farm Bureau and the Indiana Chamber of Commerce.

Several thousand persons took part in a parade headed by the Boy Scout Band, which marched through the streets of the town before the arrival of the train.

As the train pulled into the station the crowd cheered, whistles were blown and the band played. The welcome given the train was such as might have been given some visiting celebrity. Motion pictures of the parade, the arrival of the train, the unloading of the first car of the limestone and other activitnes of the day were taken.

A registration booth for the visiting farmers and their families was established at the Community Rest Room in Philadelphia street, where they received credentials which entitled them to participation in the day's events.

Later in the day in the Sixth Street Park addresses were made by J. W. White, professor of soil technology of State College; W. D. Zinn, national authority on limestone and legumes; J. W. Warner, Indiana county farm agent, and others.

Dr. White, in commenting on the deficiency of lime in the soils of Indiana county, stated there were 270,000 acres of land in the county which needed an average application of 2800 lb. of ground limestone to make them the proper medium for plant growth.

The pooling of lime purchases by the farmers and the more general use is the result of an educational work in soil improvement directed by the County Farm Bureau. By buying in bulk the farmers have effected a saving of about 20 per cent. —*Pittsburgh, Pa., Gazette-Times.*

How Roofing Granules Are Made

The Method of Manufacture and Typical Plant Design. How the Process Has to Be Adapted to the Nature of the Rock

By G. B. Livingood
Of the Traylor Engineering and Manufacturing Co., Allentown, Pa.

ROOFING granules are made of different materials which are vastly dissimilar. For example, in southern Pennsylvania and northern Maryland there are deposits of green rock which is very hard, is very slightly stratified and breaks cubical. On the other hand, in eastern Pennsylvania, southeastern New York, southwestern Vermont and in other parts of the country the waste in slate deposits remaining after commercial roofing slate is made are worked into granules. This material is highly stratified.

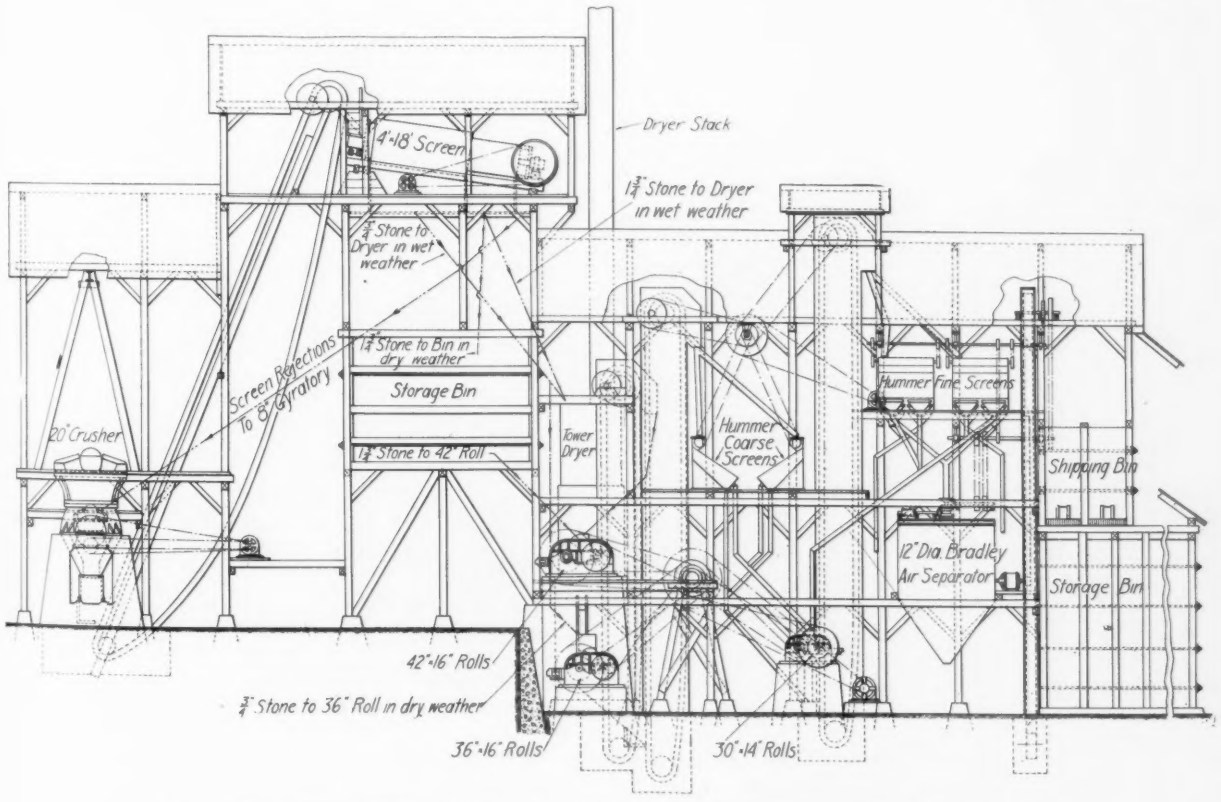
In addition to these, there are miscellaneous materials, such as a glass hard slag, of beautiful green color, the waste from chemical factory in central Pennsylvania. This works up into very durable granules, but as this quantity is limited as compared with natural deposits of greenstone rock and slate, it is perhaps not necessary to touch on the process to be employed, although it would be very similar to that for the greenstone.

In working any kind of a deposit the method employed is governed largely by the market which the manufacturer has for very finely ground waste product in the paint, asphalt and linoleum industries. In other words, if a great quantity of this product can be sold and the natural deposit is unlimited, the plant can be simplified by eliminating some of the breaks.

In the majority of plants, however, the main object is to get the greatest tonnage of granules, the idea being that in addition to the waste resulting from the process there is sufficient other waste around the plant to supply all needs for the filler trade.

Before describing the plant and process it may perhaps be profitable to define the word "fines" as used in the industry.

There are various specifications for roofing slate granules which differ within certain limits, but I believe that a general average of them all would be a product which will pass through a 10-mesh screen and be retained on a 20-mesh with a maximum allowance of 5 per cent finer than 20-mesh, but with as little as possible through 40-mesh. In fact, rejections of roofing slate have been made of material which contained as little as 2 per cent, 40-mesh and down. From a consideration of these specifications it will be seen at once that (due to the chalky nature of most slates, especially when dry) it is an extremely difficult matter to make granules without an enormous waste and therefore the flow sheet of the plant is of the highest importance.



Section through a typical crushing and screening plant for making granules of greenstone

Typical Flow Sheet

Starting with the rock as it comes from the quarry, the initial breaker usually employed is of the jaw type with very deeply corrugated plates, as this type crusher will make the break with less fines in the product than any other type and will also take care of the slabs, which constitute a great proportion of the feed, better than the gyratory crusher. In this primary breaker the rock is generally broken to 4 to 6-in. cubes and the product passed over a stationary grizzly to bypass all 1½-in. ring material which joins the stream from the secondary breaker.

Breaker Product to Rolls

The secondary breaker takes the product of the primary machine and reduces it to about 1½-in. ring, delivering to an elevator. This elevator delivers to a revolving screen which takes out all material ½-in. cube and smaller and passes the oversize to a large crushing roll breaking to ½-in. cube.

The product of this roll and the undersize of the screen should be now sent to vibrating screens which will remove finished product and waste or dust. The oversize from these screens is then delivered to one or more secondary crushing rolls which break to about ¼-in. cube, the product of these rolls being sent to another set of vibrating screens which take out finished product and dust and deliver their oversize to a third stage of rolls, which break to about 10-mesh.

The product of this third stage of rolls is sent to a third set of vibrating screens, the finished size and fines being taken out and the oversize returned to the same rolls.

A secondary system of elevators and conveyors collects in one stream the fines from the three sets of vibrating screens and delivers them to a ball mill or similar pulverizer of such size as to reduce to 200-mesh and finer.

Air Flotation

This mill is of the continuous discharge type and delivers to an air separator which "floats" off the finished product and returns the oversize, that is, all material coarser than 200-mesh to the mill for further grinding, thus forming a closed circuit.

Plant for Hard Stone

The above would be the approximate flow sheet for ordinarily hard and brittle slate and it will be seen, therefore, that with softer slate having a tendency to pulverize very readily, it might be desirable, and in fact there are several locations where it is desirable to employ instead of three stages of roll crushing four or five or even six, making the break in each case as gentle as possible in order to reduce the amount of dust produced in breaking. A somewhat different method of handling may be employed for the material worked up by the plants located in southern Pennsylvania and northern Maryland. For this particular material a typical plant is that operated by the Greenstone Products Co., Inc., at Thurmont, Md., which is illustrated in the drawing.

Scanning this plan, it will be noted that the feed from the quarry is delivered to a 20-in. Bulldog gyratory, the product of which is elevated to a 48-in. by 18-ft. screen. This crusher breaks to about 3 in. and in the large screen the perforations are 2¼ in. throughout, with a 12-ft. dust jacket, with 1-in. perforations. The rejections of the screen are returned to an 8-in. Bulldog gyratory crusher, which in turn delivers to the elevator and sends back to the large screen, thus forming a closed circuit for coarse breaking.

The through product of the screen proper, in dry weather, is sent direct to a bin supplying the coarse crushing roll of the plant, a 42x16-in., while in wet weather it is sent to a dryer which delivers to the same roll.

The through product of the dust jacket is sent the same path as the through product of the screen, joining the stream from the through product of the screen proper.

Series Roll Crushing

The 42x16 roll is set to break ⅝-in. cube and delivers directly into three sets of 36x16-in. rolls. The product of these rolls is delivered to a bucket elevator delivering to four vibrating screens with about 10-mesh cloth. The oversize from these screens is sent to one set of 30x14-rolls set to break to 3/16 in. while the undersize goes to another set of 30x14's set to break to 1/16 in. The product of both of these rolls is sent over a second set of four vibrating screens with two sets of screens 20-mesh and 10-mesh.

The through product of these screens is sent to the air separator to remove dust and undersize as per manufacturer's specifications, while the oversize in any of the 10-mesh stage is returned to the 30x14 roll which is set to 1/16 in.

Cleaned by Air Separation

The air separator receiving the finished product which is to be cleaned from dust before going to the shipping bin, delivers the fines to a pipe which spouts into the room where the asphalt and paint filler is to be made, while the cleaned product is sent to the shipping room where it is sacked or loaded in bulk on cars for shipment.

In this plant, thus far a pulverizing department has not been built as the owners feel they are securing sufficient profit from their operations by selling the granules only, although, of course, the fines are being stored with the idea of working up in the future for the paint, asphalt and linoleum trade.

For the building of slate granule plants, we emphasize as the two most important considerations in the plant design, first, that there can scarcely be too many stages of breaking in order to have the whole process as gentle as possible, due to the character of the raw material, and, second, that the removal of fines at every stage of breaking, while it involves a considerable amount of screening equipment, will pay well because it is certainly evident that a feed full of fines will contain a greater percentage when re-crushed than if it were clean.

The writer believes that with proper equipment carefully looked after and kept in first-class shape at all times it is possible to manufacture slate granules with as little as 20 to 25 per cent fines and this is borne out by personal observation in plants where machinery has been shamefully neglected and fines have run as high as 80 per cent.

One other consideration may be kept in mind at this point. The price received for roofing granules varies between $5 and $9 per ton f.o.b. plant, varying with the quality and color, whereas the filler material commands a price of $12 to $18 or $20 and even higher.

However, the granule market is established while the filler market is not, although in the case of the latter there are possibilities of enormous demands for tonnage and it may well be that the future will see present conditions reversed, namely, that the granules, instead of the filler, will be an incidental product.

Texas Cement Industry Healthy

THE Texas Chamber of Commerce, Austin, Burt C. Blanton, manager, industrial department, has completed a survey of the cement industry of the state, showing four active companies with going plants at the present time. These include the Texas Portland Cement Co., with two mills, at Dallas and Houston, respectively; the Trinity Portland Cement Co., with plant at Dallas; the San Antonio Portland Cement Co., with one local mill, and the El Paso Portland Cement Co., with single mill at El Paso. The total output of the five plants approximates 4,600,000 bbl. per year, with gross valuation at present market prices of $8,970,000. Employment is given to 1025 persons at the plants.

Chemical Exposition in New York

THE National Exposition of Chemical Industries will be held in the Grand Central Palace, New York, September 17 to 22. Several of the lectures which are illustrated with motion pictures are on subjects which will interest those connected with the various rock products industries.

Gas Bubbles in Porous Concrete

American and German Methods of Making This New Material, with Tests of Its Weight and Its Strength in Compression

Written for Rock Products by Dr. C. R. Platzmann Berlin, Wilmersdorf

(Translated from the German by R. W. Scherer)

TWO disadvantages of cement concrete prevent the extension of its use in residence building, and these are its poor insulating qualities, both as to sound and heat, and the impossibility of driving nails into concrete walls.

To remedy these evils recourse has been taken to aggregates which are themselves porous, such as furnace slag, coke ashes, pumice and other substances whose use has been common in the building trade.

It is the object of this paper to report on two recent processes that aim to produce a true, porous concrete. These processes are covered by the U. S. Patent 1,087,098 and the German Patent 327,907. The former patent embodies the principle of adding to cement some material which on the addition of water develops gas. Either metallic aluminum or zinc in the finest possible granules is used, by which, it is claimed, gases are generated to such an extent before the initial set that neat cement will attain a volume as great as if three parts of sand had been added, i.e., there is an expansion of approximately 300 per cent. The chemical reason for this is that the powdered metal and the lime in the cement and the mixing water change to calcium aluminate or calcium zinc, developing hydrogen. According to the American patent, in order to start this reaction and generation of gases before the initial set takes place, a small quantity of unslacked lime, ¼ to 2 per cent, is added.

RUMORS of a new kind of porous concrete and camouflaged descriptions of its method of manufacture have been abundant in technical and trade papers of late. This article, which is written by an internationally known portland cement specialist, has been secured by Rock Products because of the great interest of the subject, not only to cement manufacturers, but to all producers of concrete aggregates.

1—The lightest porous concrete, made of cement and aluminum powder and no sand. This is lighter than water but too costly. With the addition of 25 per cent sand it is able to withstand 1000 lb. to the square inch

The German patent referred to, while it also employs powdered metallic zinc to form gas, differs essentially from the American process in that besides the metal, which reacts with cement only at comparatively high temperatures, some salt, such as calcium chloride, is added which reacts strongly with cement at normal temperatures. The effect of the calcium chloride is to hasten the initial set while forming tricalcium-aluminate ($3CaO.Al_2O_3$). This reaction generates more heat than is created in the setting cement and, as in the American process, the metal reacts with the cement and water generating hydrogen. Both processes are based on the known property of some metals to form hydroxides of an amorphous character in wet reactions. That is, toward alkalies and earth alkalies such as lime they are weakly acid, although they are of basic character toward the more strongly ionized acids.

With the unquestionable interest of builders in light porous concrete, it seemed of sufficient importance to try out the American process, while the German process was being worked out by the writer in conjunction with Dr. Killig, director of the Degerhamm Cement Company, Oeland. It seemed quite possible that by one or the other of the methods a light concrete could be produced, suitable for concrete ship building, for light partition walls and, as is mentioned in the American patent, for filling-in reinforced concrete structures, as well as in buildings of all kinds where fire-resistance is desired.

For the success of the experiments it was found to be of the utmost importance that the metal used should be powdered as finely as possible and that it should be distributed as evenly as possible in the mass of the treated concrete. In an experimental way it was apparent that increased fineness of the metal produced greater increase in volume. A rather coarse-grained aluminum powder produced much less swelling of the mass than the very fine grained aluminum powder, procured from the aluminum-bronze industry, and offered on the market under the names "Pyro-Schliff" and "Schliff Email." Additions of stearin and paraffin to these metal powders, which are customary in the industry, proved of little value in increasing the expansion of the concrete.

2—Same as No. 1 but with 50 per cent of fine sand added. Weighs about the same as water and will withstand 662 lb. per square inch

3—Same as No. 1 with 75 per cent sand. Weighs 1.2 times the weight of water and will withstand only 239 lb. per square inch

In the first tests, measuring cylinders of 250 c.c. contents were used. In these was placed a mixture of 100 g. cement containing 1/10 to ¼ per cent of aluminum powder previously mixed with about 50 per cent water. After 10 to 20 minutes a violent generation of hydrogen began and the mass began to swell in the cylinder. The action subsided after various lengths of time, depending on the temperature, but never greater than one and a half hours. In the most favorable case the increase in volume was 127 per cent. To save cement, similar trials were made using varying proportions of sand. However, only fine-grained alluvial sand is suitable for this purpose; coarse grained sand is not carried upward by the expanding cement dough; segregation takes place so that a large proportion of coarse sand collects at the bottom of the container, though a very porous mass almost free from sand collects at the top. Since sand at best has a high specific gravity, coke ashes were tried as aggregate. The tests gave the following results:

TABLE NO. 1—CEMENT AND ALUMINUM POWDER WITHOUT SAND

Test No.	Increase in volume, per cent	Duration of expansion, min.	Aluminum content, per cent
8	116	40	1/4
12	68	92	1/10
14	70	64	1/10
15	94	65	1/10
19	100	60	1/10
21	125	40	1/10
22	103	44	1/10
23	127	37	1/10
24	98	60	1/10
25	99	60	1/10
27	100	37	1/10
28	95	26	1/10

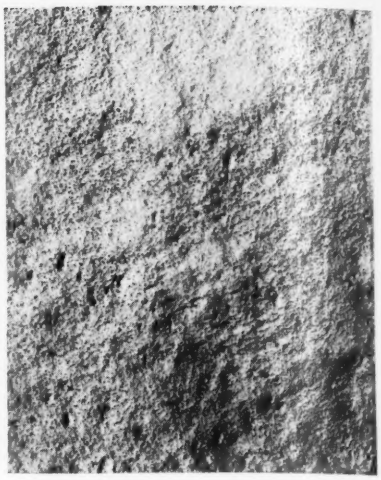
TABLE NO. 2—CEMENT AND ALUMINUM POWDER WITH SAND OR COKE ASHES

Test No.	Per cent of aggregate	Increase in volume, per cent	Duration of expansion, min.	Aluminum content, per cent
17	30	70	66	1/10
34	75	73	60	1/4
35	75	62	60	1/4
36	75	100*	55	1/4

*Coke ashes.

To increase the percentage of metal above ¼ per cent proved inadvisable for several reasons: the metal was not used up, for after the mass had hardened metallic particles were distinctly visible. The expansion was not materially increased and the reaction was so violent that the gas bubbles forced their way to the surface without increasing the mass.

The effect of the fineness of the metal powder is apparent from the results of tests Nos. 14 and 15 which were conducted with the coarser grained metal. In the tests tabluated in Table No. 2 the finest grained powder was used. The addition of sand diminishes the expansion. Without sand the expansion is from 100 to 130 per cent, with sand 60 to 75 per cent. Finally test No. 36, made with coke ashes, again showed a 100 per cent increase in volume, which is due to the lower specific gravity of the material.



4—Same as No. 1, with 80 per cent sand. Heavier than No. 3 and too weak to have any structural value

For the practical utilization of the process it was of the utmost importance to determine the strength of such porous concrete at 28 days. Test pieces were kept a day in moist air, six days in water and 21 days in air. It was shown that while very porous concrete might be made, the porosity was attained at the cost of strength.

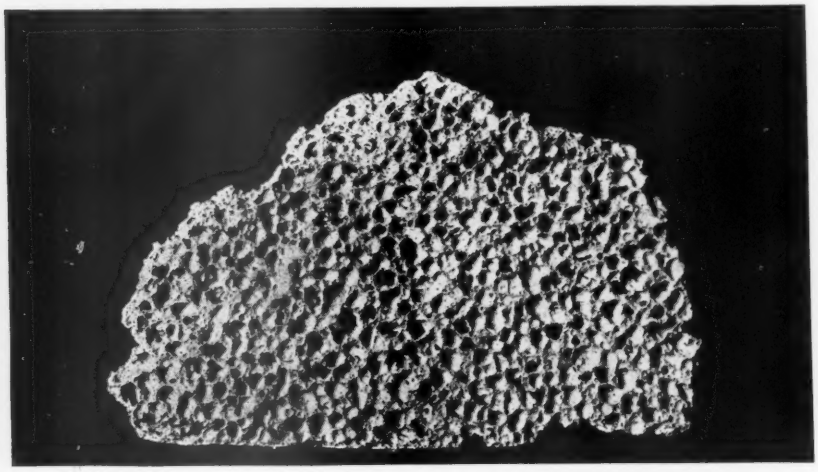
In all cases 1/10 per cent metal was used and the following results were attained:

TABLE NO. 3—STRENGTH OF POROUS CONCRETE WITH DIFFERENT PERCENTAGES OF SAND

25 per cent sand	70 kg. cm.	(985 lb. per sq. in.)
30 per cent sand	78 kg. cm.	(1098 lb. per sq. in.)
40 per cent sand	67 kg. cm.	(943 lb. per sq. in.)
50 per cent sand	47 kg. cm.	(662 lb. per sq. in.)
75 per cent sand	17 kg. cm.	(239 lb. per sq. in.)
85 per cent sand	7 kg. cm.	(99 lb. per sq. in.)

It appears therefor that additions of sand up to 30 per cent gives the mass a certain stability, while to increase the percentage above 30 leads to a marked decrease in compressive strength. Even if the strength attained does not approach that of ordinary concrete it must be considered that to produce concrete castings, such as were used in Table No. 2, the forms need to be filled only one-half to three-fourths full, the expansion due to the generation of gases being sufficient to fill them. In the tests conducted, test pieces were used, 7 cm. cubical, which were weighted with boards to insure the complete filling out of the cubical shape.

The third point of especial interest in the process was the question of specific gravity of the various castings. For this purpose test pieces were cast in the regulation compression briquet (7x7x7 cm.) in building slabs and in standard bricks (25x12x6½ cm.) which were permitted to set and dry and were then weighed. The weight in grammes divided by the con-



Characteristic structure of cement expanded by zinc powder and calcium chloride, the German method. Test pieces made by this method averaged 1200 lb. per square inch in withstanding compression

tents in cubic centimeter gave the following results:

TABLE NO. 4—SPECIFIC GRAVITY WITH DIFFERENT PERCENTAGES OF SAND

Test No.	Per cent of sand	Specific gravity
31	....	0.76
32	....	0.85
33	....	0.76
35	25	1.18
36	25	1.09
27	30	1.32
26	30	1.15
28	30	1.16
37	40	1.17
54	50	0.94
58	50	1.03
67	75	1.21

COMPARISON WITH OTHER MATERIALS

	Specific gravity
Tile	1.8
Cement concrete	2.0
Reinforced concrete	2.4
Pumis-concrete	1.2

The structure of this porous concrete is shown in the cuts.

In all of the specimens shown above, 1/10 per cent aluminum was used as a gas generator. How the size of the pores diminishes with the greater sand content is quite evident and is quite in accordance with the specific gravity which also increases with the sand content.

Zinc powder mentioned in the American patent as a possible substitute for aluminum, showed results very much less satisfactory. In the most favorable case, i. e., without sand, the increase in volume amounted to only 30—50 per cent and then only when the mixture was extraneously heated.

Much better results were obtained by the process proposed by the writer working in conjunction with Dr. Killig, the basis of which has been mentioned in the first part of this article. That the influence of calcium chloride was to increase the porosity appeared from the fact that a mixture of 400 g. cement, 9 g. zinc powder and 15 g. calcium chloride in solution produced large pores while a mixture of 300 g. cement, 9 g. zinc powder and 7.5 g. calcium chloride produced small pores. It possess another advantage over the aluminum in that the process ceases as soon as the action of the chloride, which is to increase the temperature and hasten crystallization, has subsided while with the aluminum, gas may continue to evolve as long as unconsumed particles of the metal are present, even if this action is imperceptible. While the reaction is violent for only 1 or 2 hr., it continues for days and materially effects the initial set and final hardening of the cement when aluminum is used.

Employing this process the following results were obtained:

The characteristic structure of cement expanded by means of calcium chloride and zinc powder is shown in the cut. This test piece was made with 2 per cent of zinc and ½ per cent of $CaCl_2$.

Searching for other possible gas-forming chemical some of which are mentioned in the American letters patent, nothing was found that promised success. To increase the reaction between zinc and cement, a powder galvanized with copper was tried. The results were quite negative. Using aluminum carbide an expansion of 25 per cent was determined. With calcum carbide the cement expanded 20 per cent. The comparative failure of both these carbides is probably due to the fact that they react with the water forming acetylene and methan respectively, while in the case of zinc and calcium chloride, the lime of the cement furnishes the third component to the reaction. When adding 50 per cent of water a large part of it is used in hydrating the cement; only a small part remains for the formation of hydrogen gas. But to increase the water content was impracticable because the gas bubbles could rise through a slushy mixture, as gas bubbles do rise through liquids, and no expansion was possible. In the same way the reaction was too violent with sodium carbonate and with aluminum chloride to permit expansion of the concrete, aside from the disagreeable smell of the aluminum chloride which alone would prohibit its use. A further attempt to use magnesium superoxide with an organic reducing agent, such as stearine, to generate oxygen failed completely. Zinc and caustic potash as well as chloride of iron and calcium carbonate, while they did expand the concrete slightly, did not nearly approach the effects attained with either powdered aluminum or the zinc and chloride of lime combination.

In all cases the initial set of the cement is disturbed by the action of the chemicals. Though it is claimed in the American patent that the gas-producing reaction ceases at the moment when the initial set begins, it must be remembered that setting begins as soon as cement comes in contact with water and not at the time when the imperfect Vitak-needle apparatus records it. And at all events, aluminum and zinc and chloride of lime, react with the component parts of cement and change its chemical composition. These chemical changes and the less dense structure of the porous concrete compared to normal concrete probably furnish the explanation why the strength of the porous concrete was not greater.

TABLE NO. 5.—POROUS CONCRETE WITH ZINC AND CALCIUM CHLORIDE

Test No.	Per cent of metal	Per cent of $CaCl_2$	Compressive strength
162	2¼	3¾	90 km. sq. cm. (1267 lb. per sq. in.)
171	2¼	3¾	72 km. sq. cm. (1014 lb. per sq. in.)
172	2¼	3¾	96 km. sq. cm. (1361 lb. per sq. in.)
173	2¼	3¾	94 km. sq. cm. (1333 lb. per sq. in.)
174	2¼	3¾	76 km. sq. cm. (1077 lb. per sq. in.)
	Average Compressive Strength 85 km. sq. cm. (1196 lb. per sq. in.)		
285	2½	6	85 km. sq. cm. (1196 lb. per sq. in.)
286	2½	7	42 km. sq. cm. (591 lb. per sq. in.)
287	2½	8	30 km. sq. cm. (422 lb. per sq. in.)

Summary

(a) Two patented processes are reported on, U. S. Patent 1,087,098 and German Patent 327,097, by which it is proposed to swell concrete through the generation of hydrogen, before initial set takes place.

(b) Tests of the American process using powdered aluminum as gas-former, showed increases in volume up to 130 per cent. Compressive strength were considerable when 25—50 per cent of sand was used. The specific gravities varied between 0.75 and 1.2 depending on the sand content.

(c) Using the German process, with zinc and chloride of lime average compressive strengths of 85 kg. sq. cm. were attained.

(d) Experiments with other gas-generating chemicals are reported, all of which, however, were shown to be less effective than those mentioned above.

Indiana Public Service Commission Lowers Rates

REDUCED rates on crushed stone from Spencer and Greencastle, Ind., to 211 destinations on eight railroads were ordered by the Public Service Commission recently. The new rates are to go into effect on or before September 20, the order says.

The order was issued on petition of the Midwest Crushed Stone Quarries Co. of Indianapolis, which has quarries at Spencer and Greencastle. Lawrence R. Cartwright is vice-president of the company.

Freight rates on crushed stone enter largely into the costs of road contractors, it is said. Much of the crushed stone goes into road improvement.

In its order the commission said that the rates which were ordered reduced were prejudicial and, in some instances, discriminatory to the Spencer and Greencastle shipper. The railroads affected by the order and the number of destinations on their lines affected by the decrease orders are as follows:

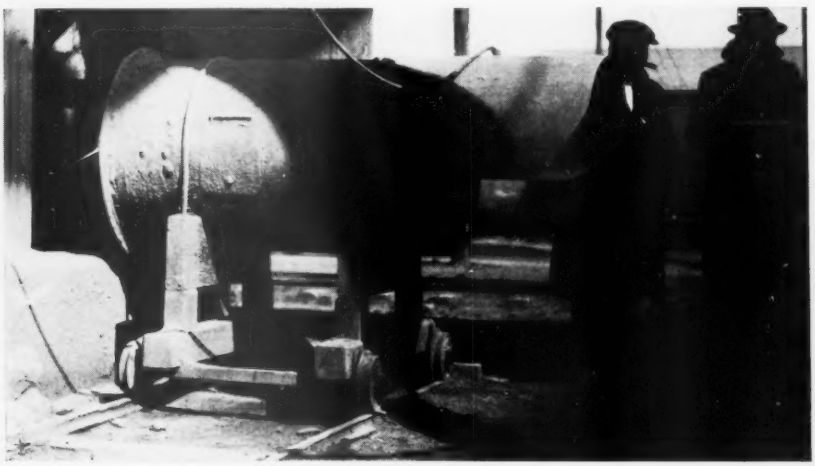
From Spencer—Evansville, Indianapolis & Terre Haute Railroad Co. to reduce rates to 36 points on its line; Chicago, Milwaukee & St. Paul Railway Co. to 35 points on its lines; Illinois Central Railroad Co., 14 points. Cincinnati—Indianapolis & Western Railroad Co., 12 points; Baltimore & Ohio Railroad Co., 25 points; Chicago, Indianapolis & Louisville Railway Co., 31 points; Chicago & Eastern Illinois Railway Co., 17 points. From Greencastle—P., C., C., C. & St. L., four points; C., M. & St. P., 16 points; C., I. & W., 10 points; I. C., two points.

Thirty-two destinations out of Greencastle and 179 out of Spencer are affected by the order. All are in Indiana. The company filed its petition with the commission May 7.

Hints and Helps for Superintendents

A Mobile Fan

ANOTHER of the homemade pieces of equipment designed, built and put into service by D. B. Simons, superintendent of the Southern States Portland Cement Co., Rockmart, Ga., is a large electric fan, mounted on wheels for use in the underground conveyor galleries of the finish storage tanks.



This electric fan can be moved from one conveyor gallery to the other. It has solved a dust problem of long standing

The fan proper is enclosed in a steel cylinon a truck made up of four small quarry-car wheels and axles and 4x4-in. timbers. The fan proper is enclosed in a steel cylinder 3 ft. in diameter with a sort of hood at the intake end. It is held on the truck by two ⅝-in. rods which pass around it in hoop fashion. The blades of the fan were cut from one piece of ⅜-in. steel plate which is mounted on a 1-in. shaft and powered by a small motor. A cable extending from above permits the fan to be moved from one gallery to the other without disconnecting the wires.

Another Method of Eliminating Coupling on Inclines

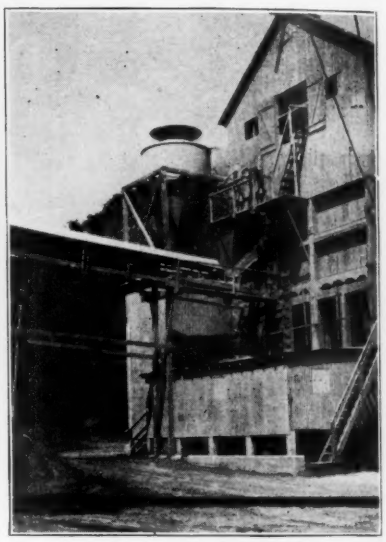
THE illustration herewith shows another scheme for eliminating the necessity of coupling and uncoupling cars at the foot of a quarry incline. Instead of a single dolly car, as illustrated in ROCK PRODUCTS of August 25, a continuous chain with cogs runs over pulleys at top and bottom of incline. The cogs catch under the cars and pull them to the top of the incline without the use of a cable. The empty cars are released and returned to the quarry by gravity on a track having a more gentle slope.

Power to operate the chain is a small electric motor located in the house at the top of the incline. Of course, a gasoline or oil engine could be used with equal effectiveness. Like a hoist, the chain is operated only when there is a car to be moved up the incline. This layout also has the additional safety feature of the cars returning on an entirely separate track so that workmen or trainmen at the foot of the incline are in no danger from such returning empties.

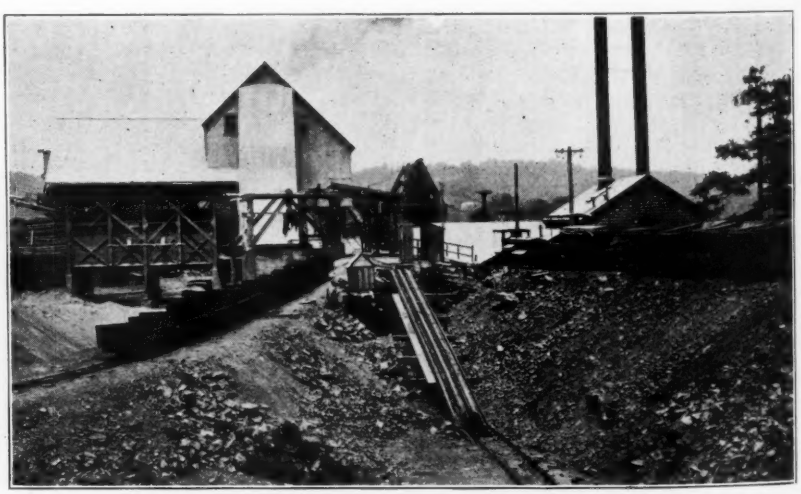
This is a view of one of the New Jersey quarries of F. W. Schmidt, president of the National Crushed Stone Association.

Saving Rock Dust

LIMESTONE quarrymen are quite well aware that fine limestone dust is a marketable commodity, but it is not generally known that any fine rock dust is a valuable product. Ordinarily the kind of rock is not an important consideration in the use of "mineral fillers." Such fillers are used in asphalt paving, in the manufacture of paints, linoleum, and many other pulp and fibre goods. The illustration herewith shows how the J. S. Lane & Son crushing plant at Westfield, Mass., collects trap-rock dust



Saving trap-rock dust

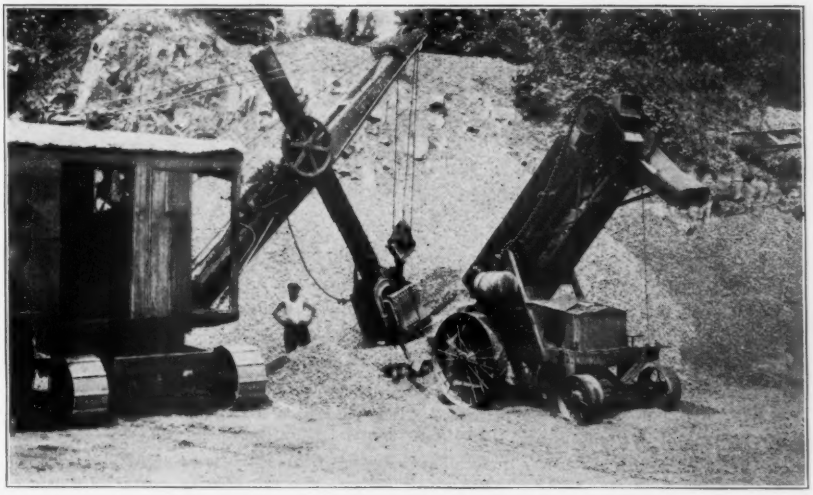


Device for saving coupling and uncoupling quarry cars at the foot of incline by eliminating cable hoist and substituting chain and cogs

with an ordinary cyclone dust collector with inlets at crushers and rolls, not only making the air around the plant better for breathing, but saving a valuable byproduct. This dust is used as an asphalt filler.

Use for Old Screen Plates

NEARLY every plant superintendent has some use for old screen plates. The illustration herewith shows a section of heavy screen plate with 3-in. openings placed under the head pulley of the main conveyor of a gravel plant to screen out the fines before putting the oversize through a gyratory crusher. Many gravel plants do not take the trouble of removing the sand and small gravel ahead of the crusher, but the crusher plates will last much longer if some sort of grizzly is installed. Such an installation is cheap, requires little headroom, and is certainly fairly effective. It would be interesting to compare experience on the comparative effectiveness of the screen plate and a bar grizzly under the same conditions.



One use of quarry waste spcae and small caterpillar-tractor shovel

A derrick is a useful device at crushing and gravel plants

One Use of Waste Quarry Space

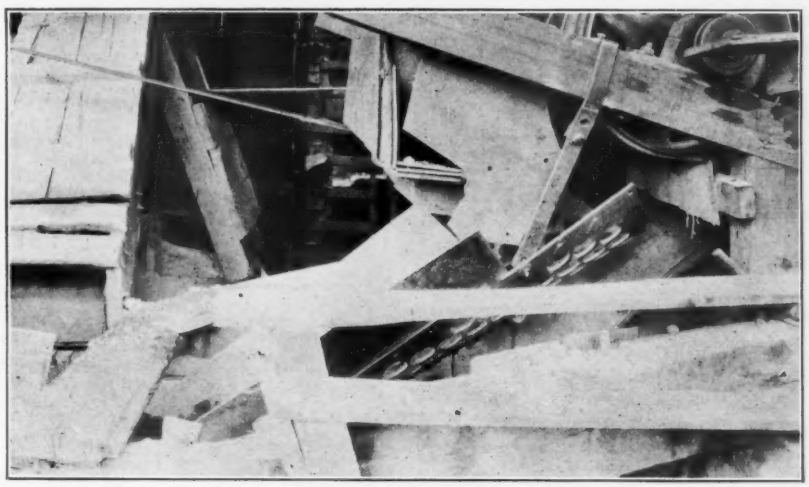
THE view at the right shows one of the quarries of the Morris County Crushed Stone Co., in New Jersey, with a part of the worked-out quarry used for the storage of crushed stone. The stone is brought from the crushing plant, at the right (not shown), in small cars on a gravity operated railway and dumped into the quarry. The stone is loaded out of storage by both a Haiss wagon loader and a small caterpillar-tractor steam shovel. The bottom of the quarry is accessible from the street to motor trucks.

The advantage of using the quarry floor for storage is that material can generally be deposited there by gravity from the plant. Of course all quarry floors cannot be made accessible to trucks or railway loading tracks, but it is apparently about as cheap to elevate material in trucks or cars as it is in any other way.

Unloading Derrick Is Useful

CRUSHING plants and gravel plants have to handle machinery and repair parts weighing several tons each. Experience proves that an unloading derrick of the ordinary swing-boom type, placed convenient to railway tracks, is one of the most useful pieces of equipment and one of the best investments a plant superintendent can make. Very often the same derrick can be used for placing crusher parts and screen plates in the plant, and for taking materials from bins and stock-piling it in locations convenient to car loading tracks.

Incidentally, the illustration herewith shows crusher repair parts neatly stacked, painted and greased—all details which help to insure long life and efficiency, as well as adding attractiveness to an ordinarily very unattractive manufacturing plant.



Use for old screen plate as a grizzly

Cost Finding and Its Problems in the Sand, Gravel and Quarry Industries

By Alfred Baruch
Consulting Industrial Engineer, New York City

V—Requisition for Supplies and Stock Records

THE quarryman has a simple material problem. His material consists of sand or rock. Although recording his material is an easy task, it has its disadvantages in the fact that sand bank owners cannot help themselves by reducing the supply at times of low demand. Consequently, the only resource he has for saving is to keep a close watch on the other supplies connected with quarrying. These records must always be written just as it is necessary to write all cash transactions in the cash book.

The Form of the Requisition

The heading should contain the name, Requisition, Department, Date, and Charge Number. The charge number used is the one that applies to a special lot going through the plant when the supplies were drawn from the storeroom and are to be used for this lot only. But when the supplies are for general use in the plant, an expense order number must be given to the requisition which charges the particular department that is to use it.

The body should contain columns headed:

1. *Quantity*—This provides for the number of items of each kind of material used.
2. *Description*—This column records the kind or type, as shovel, picks, etc.
3. *Size*—This is provided for those materials whose descriptions do not indicate the size.
4. *Price and Amount*—These columns are self-explanatory.

At the top of the slip, a space provides for the *signature* of the man who issued the requisition. It will be noticed that in the above requisition provision is made for the price and the amount of the supplies consumed. The purpose of this is to charge the supplies with their actual cost as nearly as possible. The price is not put on the requisition. It not only necessitates referring back to other records, but it means averaging up expenses which should be actual at all times. It is not necessary to extend the full amount of the supplies' cost at the time the requisition is issued. All that is needed is to put the price of the material on the slip. When it comes back from the foreman to be filed in the expense file, the total amount may be extended.

REQUISITION FOR SUPPLIES

Dept.....Charge No.....Date.....

Issued by.....Foreman.....

QUANTITY	DESCRIPTION	SIZE	PRICE	AMOUNT	

Fig. 2. Printed on a 4x6-in. card and filed in box file

It is very difficult, however, to convince the average quarryman that written records are an absolute necessity. They are always time-savers since they standardize the routine and enable the men to do the same thing in the same way at all times. Consequently, a requisition for supplies withdrawn from the storeroom should always be written. The proper origin of this requisition will be discussed later.

If the plant is large enough, which means a large enough storeroom, there should be a storekeeper on the job at all times. He is the only man who should be entrusted with taking supplies out of the storeroom. This man could keep all records and hand out tools and supplies himself, so that he alone is responsible for everything he handles. If the plant cannot support a storekeeper, the foreman must do this work, although there are serious objections in the way of burdening the foreman with this clerical work. He should be free to supervise the activities of the men as much as possible.

The Stock Records

It is a sound business policy to keep the investment in supplies and other operating expenses down to a minimum. However, it is not wise to permit the plant to run out of supplies which may actually cause a holdup in production. It is necessary to have a storeroom. The storeroom acts as an expansion joint between the purchased supplies and the plant. This joint prevents the work from being stopped because of lack of the necessary supplies and enables the operators to take advantage of the market. If the quarrymen depended on requisitions coming from their plant to get their supplies, they would find themselves hindered and encumbered by exasperating delays in delivery and by errors and mistakes which might prove costly at a critical moment.

The question of how large or how small a storeroom should be cannot be decided abitrarily. Every one must use his own judgment in this matter. Of course the storeroom has to be as large as the biggest supply on hand at any one time. The storeroom permits the operator to put his supply under lock and key and prevents waste, carelessness and theft.

There are other reasons why a storeroom is a necessity. Stores represent cash. A worker who would cut dollar bills in half, throw them around, leave them in out-of-the-way places, would very soon lose his job—and be reported as insane besides. But no one reports a worker as insane for discarding equipment that is still useful or for wasting material or supplies when a little care would effect great savings.

In the preceding paragraphs, we discussed the methods by which the consumption of supplies can be determined. One way is to put a card on the rack or bin where the material is stored and have each worker make the deductions of the quantity he is taking away. There are several objections to this method. The workers dislike any clerical work and are sure to neglect it unless carefully watched. Besides, a worker tends to scrawl and usually his hands are dirty, so that the card soon becomes illegible, and its value is destroyed. This would be no gain over no record at all. It would simply mean additional work. But it is necessary to identify and account for the supplies and a record of one type or another must be devised.

The perpetual inventory must be checked for accuracy at some time or another. It gives a complete knowledge of the materials and supplies on hand. It automatically records the consumption of supplies. It furnishes a record of changes in price. It makes bank and income tax statements an easy accomplishment.

If there is a storekeeper, the maintaining of a perpetual inventory system is a simple matter. He gets the record of the consumption from the material charge slip. This takes out of the hands of the worker the matter of keeping stock records and at the same time provides the proper charge to each expense or production order.

The form should be designed as follows:

In explanation of the foregoing, the space following the word description is devoted to the particular kind or type of material in one place. Size, unit and location are self-explanatory. In deciding the quantity of the material or supplies to be carried, it is better to establish a maximum and minimum limit. The minimum limit represents the quantity of supplies less than which it is necessary to carry. The maximum limit represents the quantity of supplies that it is necessary to carry. The maximum limit represents the quantity of material that the operator is willing to carry at any one time. The balance on hand should range somewhere between these two limits.

Heading: Description	Size	Unit	Location	Maximum Limit	Minimum Limit
Body:					
1. Ordered					
a. Date					
b. Order number					
c. Quantity					
d. Total					
2. Received					
a. Date					
b. Order number					
c. Quantity					
3. Issued					
a. Date					
b. Quantity					
c. Department					
4. Balance on hand					
a. Quantity					
b. Current price					
c. Amount					

The importance of maintaining the established quantity of supplies cannot be overemphasized. These limits are determined by experience, and to ignore them even for a little while means taking an unnecessary and unbusinesslike risk. They insure the work being done properly and efficiently, and they prevent too much money from being tied up in supplies. They serve as a measure of the efficiency of the plant and help to determine the rate at which the supplies are consumed. If the supplies are not being consumed at a normal rate, it means the production is not going forward at a normal rate.

The minimum limit marks the danger line when the stock gets low. The maximum limit is established to provide for a favorable market, when the operator has reasonable assurance of a given volume of work and wishes to take advantage of low prices. At times it is not always convenient to buy small quantities. Purchases in larger quantities usually bring larger discount and prompter service.

The column headed "Ordered" is provided as a reminder of purchase orders that have been placed but which have not as yet been delivered. In this case it is absolutely essential that the supplies be on hand when they are ordered; at the same time, it is impractical to carry too large a stock simply to provide for emergencies. The minimum and maximum limits anticipate all emergencies.

The "Date" column is provided for order follow-up and the "Order Number" for a proper charge to the individual expense order. The received column is a cumulative record of the quantity of the material or supplies delivered to the plant. This date establishes the elapsed time between placing the order and delivery. The issued column records the quantity consumed. This is also a cumulative record. The difference between the issues and the receipts is the balance on hand. The price and amount column are self-explanatory.

The function of the perpetual stock record is to provide the plant with accurate record of the quantity of supplies on hand without necessitating an actual count of the stock itself. This method has several distinct advantages, namely:

INVENTORY RECORD

Description..... Rate.....

Minimum..... Maximum.....

ORDERED			RECEIVED			ISSUED			BALANCE	BALANCE
Date	Ord. No.	Quantity	Date	Ord. No.	Quantity	Date	Quantity	Dept.		

Fig. 1. This is printed on 8½x11-in. ledger paper and punched for a three-ring binder

1. It permits intelligent purchase of supplies. A knowledge of what is needed and what is on hand makes it possible to take advantage of market conditions.

2. It permits planning the work of the plant with great saving of time and money.

3. It makes possible the determination of the cost of production without resorting to an actual physical inventory.

4. It permits a quick statement of the assets for the purpose of borrowing money from the bank.

5. In case of fire, the insurance company is much more likely to credit claims for stock destroyed, if the stock records are brought forward promptly to enforce the claims.

6. It reduces waste and theft by charging the individuals with the material taken out.

(To be continued)

Lime in Lubricating Grease

Lime and Mineral Oil Make a High Grade Lubricant

By F. L. Koether

Technical Director, Lubricating Works, Acheson Graphite Co., Niagara Falls, N. Y.

THE use of lime in the manufacture of lubricating greases is of considerable industrial importance (in spite of the fact that the tonnage used is relatively small) because these greases afford improved lubrication for machinery of nearly all kinds and greatly aid in the conservation of oil. Calcium soap greases withstand pressure and heat much better than oil lubricants, waxes, and petrolatum; compared with soda soap greases (sponge greases) they form a smoother, more continuous film of lubricant in a bearing and hence give better lubrication within the range of work to which they are adapted. Calcium soap greases will not, however, withstand as high a temperature as soda greases. Each type of lubricant has its own field, but calcium soap greases are preferable for the majority of grease applications, including all cups on ordinary machinery, shafting and automobile chasses.

Hydrated lime is the most convenient and satisfactory form to use in making lubricating greases. Essentially the process consists in mixing the correct chemical proportions of lime and tallow or other fat, boiling with an excess of water until a complete reaction has taken place, forming calcium soap, and introducing mineral oil with constant stirring until a colloidal jelly of the proper consistency is obtained. The consistency, otherwise called body or density, is governed by the amount of oil absorbed by the soap jelly, the temperature conditions, amount of moisture, and to a certain extent by the nature of the fat used. A wide range of fatty materials may be used, each producing a grease of apparently the same nature, but each different fat requires somewhat different treatment in the boiling, and the resulting greases differ slightly in melting point, tendency to separate and amount of soap required to make a given consistency. Some of the materials commonly used by different manufacturers are inedible packers' tallow, horse fat, white grease (inedible lard), soya bean oil, and the fatty acids of these after the glycerine has been separated.

The use of calcium soap greases is sometimes criticized because lime is used in making them, the inference being that this lime is still present in the form of a hard gritty substance. This criticism is unfounded when pure lime is used in correct proportion, as the lime completely loses its identity when reacting with the fats and appears to dissolve as freely in the kettle as sugar does in hot water. The resulting product is a jelly which is superior in lubricating qualities to any of its constituents. Impurities in the lime, however, such as silica, magnesia, etc., do not react with the fat and remain in the grease in their original form. For this reason, a very high purity of lime is needed. A brand of lime which is used extensively for the manufacture of high grade cup greases averaged over six different shipments CaO 73.5 per cent, MgO .35 per cent, R_2O_3 .31 per cent, and insoluble .60 per cent, CO_2 1.0 per cent. From this lime a cup grease with less than one-half of one per cent uncombined mineral matter can be made.

For making the usual grade of cup grease, a light mineral oil known as 25 deg. parafine oil is generally used, so called because it is the distillate from which parafine wax has been removed. This oil is recognized to be low in lubricating value. Recent fundamental work on lubrication by W. B. Hardy, R. E. Wilson, Southcombe & Wells and others has shown that lubricating ability is greatly increased by the presence of minute amorphous bodies of a plastic, semi-solid nature which form an adhering film on the metal surfaces. Parafine oil lacks these substances—the soft plastic calcium soap jelly formed in grease supplies this lack, forming a better lubricant than the best oil.

For transmission greases, a 600 deg. fire test "steam refined cylinder stock" is generally used, although some use the cheaper darker colored fire distilled product. At least one widely advertised and distributed transmission compound is composed of a small percentage of calcium soap jelly worked down to a nearly fluid state with cylinder stock. Other manufacturers use sodium soap jelly instead of calcium for this purpose because of its greater elasticity.

Lime is also an essential constituent of another, though distinctly lower quality, lubricating grease known as rosin grease or cold set grease. When ordinary hard gum rosin is heated in a still, decomposition takes place and the distillate, known as rosin oil, has the power of reacting with lime at ordinary temperatures. Greases are made by mixing hydrated lime into a mineral oil and then stirring in 10-15 per cent of rosin oil. The mixture starts to stiffen immediately and sets to form a smooth grease in a very short time. Rosin grease made from parafine oil forms the common "light axle" grease. When summer black oil is used a dark sticky grease, much used for lubricating rough gears, wire ropes, rail curves and like rough work is obtained.

These greases lose body quite easily when worked, they also contain an excess of free lime and sometimes free rosin oil, both of which lower the lubricating value. They are distinctly cheaper, however, than greases made from fats and are used extensively and generally with satisfaction.

The manufacture of high grade lubricating greases is rapidly developing from being a small side line to an important industry. This is due largely to an increasing appreciation, on the part of engineers, of the advantages of grease lubrication. While it is true that the power required to move a grease-lubricated test shaft is slightly more than one lubricated with oil under ideal conditions, the grease film is much more dependable, lasts longer with each application and does not squeeze out, is cleaner and more economical, thus giving the practical advantage to grease in many cases. Much damage is done to oil-lubricated bearings in starting and stopping and under heavy shocks. This is avoided with grease.

The use of grease is therefore increasing steadily, and with it the profitable outlet for high grade lime.

First High-Calcium Lime Plant in Wisconsin

Western Lime and Cement Company Building Experimental Plant at Green Bay to Burn Michigan Stone

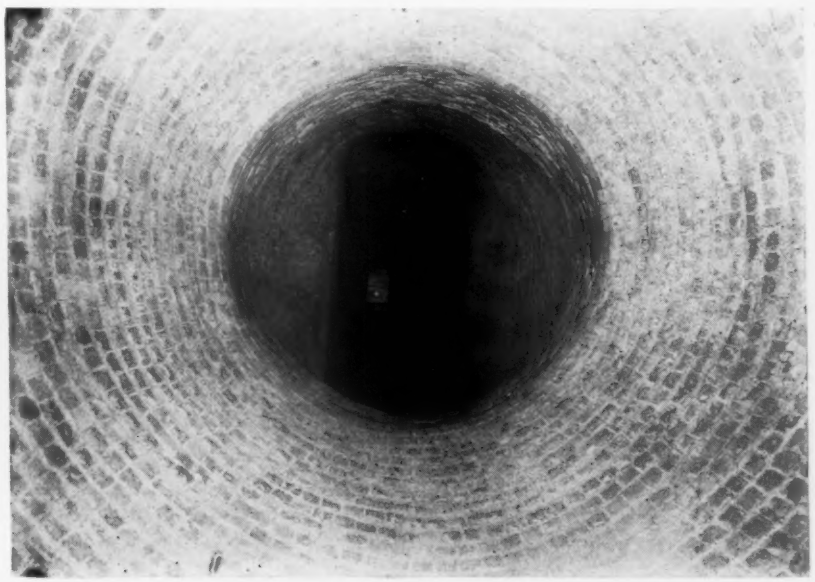
WISCONSIN has immense deposits of some of the purest dolomitic limestones in the world. It has great deposits of pure silica and quartzite. But a limestone containing less than a considerable percentage of magnesium carbonate has never been found within the boundaries of the state. That is the reason why Wisconsin, which is a big user of portland cement, has never had a portland cement manufacturing plant.

George W. Nast, general manager, and Harvey S. Owen, chief engineer

Across Lake Michigan the northern peninsula of the State of Michigan has immense deposits of practically pure calcite (calcium carbonate) and these resources are now being used in Wisconsin for the manufacture of high-calcium chemical lime at Green Bay and will soon be used for the manufacture of portland cement at Manitowoc.

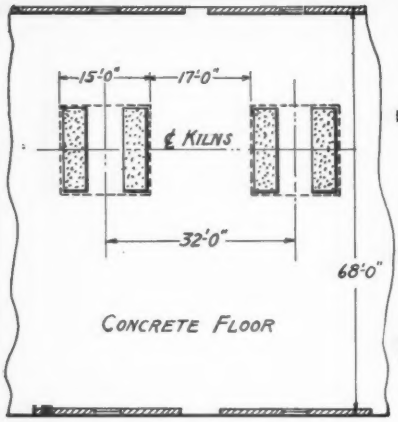
The Green Bay lime plant is the property of the Western Lime and Cement Co., Milwaukee, which already owns and operates 12 other lime plants in Wisconsin (all dolo-

Method of supporting steel and concrete floor from kiln bases

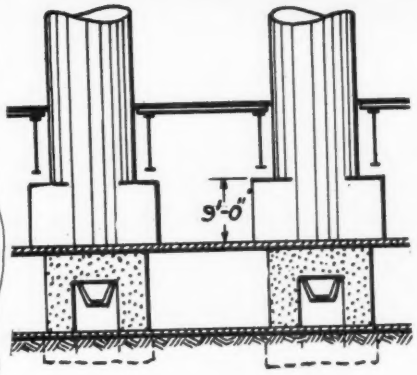


Interior of a standard Arnold and Weigel lime kiln, showing choke and section at fire-box zone

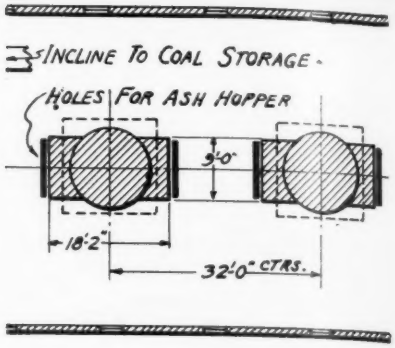
Firing floor of kiln house showing fire-boxes of adjoining kilns arranged opposite each other



Plan of kiln foundations



Longitudinal section of housing



Roof Over Loading Shed

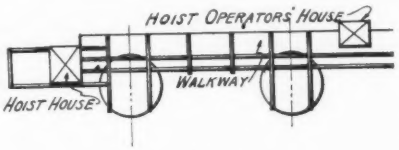
R.R. Siding

mite plants). It is situated on the west bank of the Fox river with 1000 ft. of dock frontage on the river and harbor. Stone is received in self-unloading lake steamers from the quarry of the Kelley Island Lime and Transport Co., near Rockport, Mich.

Details of Plant

The new plant was designed largely to try out, and compare results of, three distinct types of shaft kilns, with the final object of rebuilding the present wood-burning kilns of the company's other plants along lines demonstrated to be the best at the Green Bay plant. For that reason the new plant is of much more than ordinary interest both to this company and the lime industry as a whole.

All three kilns are 52 ft. high above the lime-drawing floor. All are 12 ft. outside diameter with ¼-in. riveted steel shells.



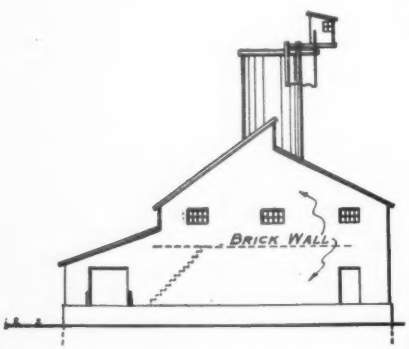
Plan of kilns and hoist arrangement

All are lined with Franklin Crown Brand fire brick and block laid up in Thermolith mortar (Harbison-Walker refractories). The backing is common brick laid up in lime mortar. Each kiln has 4 in. of Sil-O-Cel insulating powder between the backing and the shell—being the first shaft lime kiln to be so insulated. The insulation extends from the level of the firing floor to the feed hopper at the top.

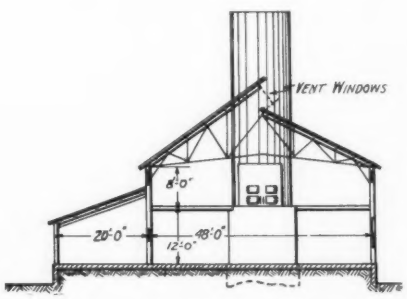
Cross-section through kilns

Kiln No. 1 is a standard Arnold and Weigel shaft kiln of 12 tons daily capacity, equipped with their standard coal-fired furnace, or fire box, McGinty shaking grates, water pan, choked kiln cross-section, and other special features of these standard kilns.

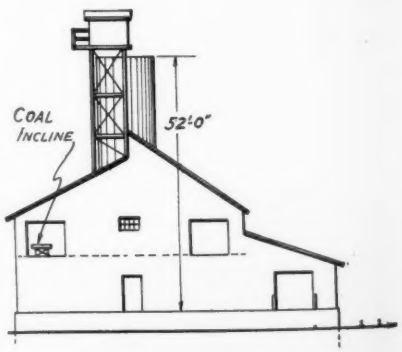
Kiln No. 2 is equipped standard Arnold and Weigel fire boxes, but its interior has a special lining, or cross section with straight walls and no choke, designed by George W.



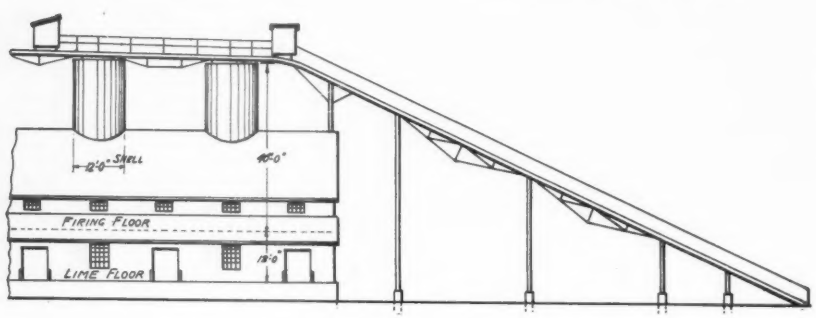
End elevation of kilns



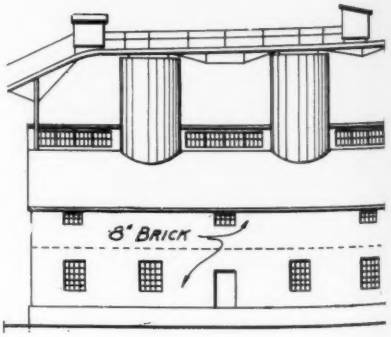
Cross-section of kiln building



End elevation of kilns

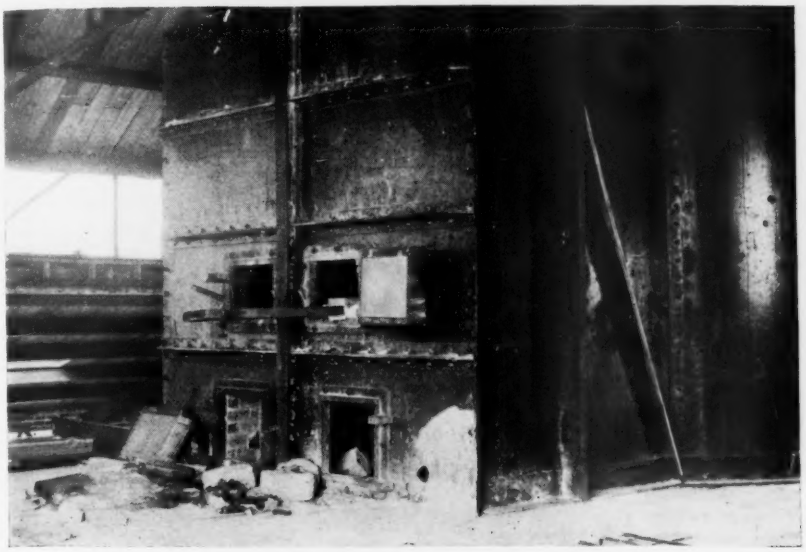


Elevation of kilns and incline



Side elevation

General view of plant from railway tracks



Fire-door and furnace construction of kilns

Lime-drawing floor of kilns

Nast, general manager of the company. The upper 17 ft. of the kiln, or the stone hopper, is lined with vitrified paving brick. The furnace is designed to burn either wood or coal.

Kiln No. 3 is a producer-gas-fired kiln designed by Harvey S. Owen, chief engineer of the company, with special features on which patents have been applied for. The gas producers are 8x6x12 ft. high (inside), built under the firing floor of the kilns, and immediately adjacent to the kilns, so that there are no pipes or ducts of any length. The walls of the producers are 24 in. thick. They are the suction type of producer with shaking and dumping grates and with water reservoirs under the grates. The admission of air and steam to the producers, under the grates, is provided with accurate control. The fire-brick arches of the producers are insulated from their 6-in. concrete tops by 6 in. of Sil-O-Cel insulation.

Producer Gas

The producer gas, instead of being introduced into the kiln through ports or tuyeres and burned inside the kiln, are introduced into combustion chambers of special design. These combustion chambers are of large size with several large openings into the kiln and have air and steam inlets so placed and under such control that it is expected to be able to get any combination of air, gas and steam desired. The air-preheating arrangement is designed to utilize the heat radiated from the combustion chambers.

This kiln is expected by its designer to have twice the capacity of either of the others.

The cooling cones, or hoppers, are the same in all the kilns, being of unlined steel with shear-drawn bottoms. The kiln foundations are all of reinforced concrete in which 10 per cent of hydrated lime was used. The subsoil is quick sand and the foundation mats or slabs rest on 35-ft. maple piles capped with 4 ft. of concrete 16x16 ft. square. A loaded kiln was estimated to weigh 700 tons.

Lime Shed

The kilns are surrounded by a remarkably light and roomy shed, with the exception of the roof covering, built entirely of steel and reinforced concrete. This building is 68 ft. wide by 113 ft. long, of the cross-section illustrated. The walls are 12 in. of reinforced-concrete up to the lime floor and 8-in. brick masonry above this level. The roof is 2-in. plank covered with Carey's roofing. The lime floor (68x113 ft.), or drawing floor, is 6 in. of concrete laid on a 9-ft. fill of limestone screenings. The firing floor (48x113 ft.) is 6 in. of reinforced concrete resting on steel beams. All beams, columns, girders and roof trusses are of structural steel fabricated by the Manitowoc Shipbuilding Corp., Manitowoc, Wis., and are bolted together. The whole structure is designed to be extended several hundred feet as new kilns are added.

Packing Sil-O-Cel insulation back of brick lining in kilns. These are the first shaft lime kilns to be so insulated—a step forward for the lime industry

The kilns are fed by an incline railway with a hoist on top, using two-way steel dump cars. Electric power is used throughout.

General Data—Personnel

Fuels, stone, lime and flue gases will be subject to rigid chemical analyses and plant control will be along scientific lines. Kiln No. 1 was fired on August 18 and it was expected to have the entire plant in operation with a daily capacity of 50 tons at the end of 30 days.

The plant is served by lake steamers of maximum tonnage and by the Chicago & Northwestern, the Kewanee, Green Bay & Western, and the Chicago, Milwaukee & St. Paul railways. The lime manufactured here is intended primarily for the Fox River valley paper industry. The site and docking facilities have ample provision for 20 kilns. A hydrating plant will be built in 1924.

The general idea of the plant layout was conceived and construction supervised by R. C. Brown, vice-president of the company; George W. Nash, general manager, and Harvey S. Owen, chief engineer. Other officers of the Western Lime and Cement Co. are O. W. Robertson, president; Vincent F. Nast, treasurer, and Ferd Mumm, general superintendent.

Signal Plant Expected to Be in Operation in Sixty Days

The huge plant of the Signal Mountain Portland Cement Co. is nearing completion. The industry will begin production in 60 days, unless something unforeseen arises, according to Vice-President C. S. Steward in commenting on progress Tuesday. A force of 175 men is at work now hastening completion of the huge industry.

The first two units—the plant is being constructed so two additional units can be added later—represents an investment of $1,500,000. The plant will have a capacity of 2500 bbl. of cement a day, or about 900,000 a year.

The huge silos have been completed. The line from the Tennessee Electric Power Co. has just been completed and the energy turned on. The raw grinding machinery will be tried out in about ten days. The huge electric crane is in position and is awaiting arrival of a factory representative before testing it out.

Some of the buildings have been completed already. The large raw storage building, a structure 80x700 ft., will be ready for the roof by about September 1. The raw grinding building is about 98 per cent completed. The coal grinding machinery is in place and will be tried out in about ten days. A blast will be set off in the quarry of the company in seven or eight days. The first order for coal has just been placed. Forty cars and an additional 50-ton switching locomotive has been ordered. One is already in operation.

Through an arrangement with the county, a concrete road will be built from Glendale station to a point a considerable distance below the plant. The company will give the county the necessary cement and crushed stone and the county will furnish the labor building the road. The fill has already been made and has been allowed time to settle before putting on the surface.

Officers of the Signal Mountain Portland Cement Co. are John S. Senior, Chicago, president; C. S. Steward, Chattanooga, vice-president; J. L. Caldwell, Chattanooga, vice-president; J. P. Hoskins, Chattanooga, treasurer; Paul S. Steward, Chattanooga, assistant secretary; A. C. Deer, manager of construction and operation; B. R. Alford, resident engineer and superintendent of construction.—*Chattanooga, Tenn., News.*

Ft. Worth Cement Plant

C. E. VERICKSON, vice-president and general manager of the Trinity Portland Cement Co., Dallas, Texas, was a recent visitor in Chicago. He was completing arrangements to poceed at once with the construction of the Trinity's new plant at Ft. Worth.

Sand Rate Hearing Called at Topeka

A REHEARING on the rate order of the Public Utilities Commission on intrestate sand shipments has been set for September 18, according to E. H. Hogueland, commerce counsel for the Topeka Traffic Association.

The Topeka companies last year claimed that the adjustments of rates on the mileage basis, made by the commission last October, gave the Lawrence companies an advantage in rates. The commission reconsidered and reverted the rate system to the group plan, wherein all companies in certain eastern parts of Kansas were given the same rates to the same points.

Now the Lawrence companies are asking a rehearing and a new order returning rates to the old basis.—*Topeka Capital.*

Lime Used in Bleach Making

Use for Thirty to Forty Thoushand Tons of Lime Each Year

By Ralph C. Snowdon, Ph.D.
Hooker Electrochemical Co., Niagara Falls, N. Y.

THIS short article is presented with the idea of outlining some of the problems which the maker of bleaching powder and bleaching solutions has to face. I shall endeavor to keep this discussion in such a position that it will be of some value to the lime producer whose stone as raw material, or whose finished product in the form of burned or bulk lime, is of such quality that it may be considered for bleach-making purposes. If this sort of information can be disseminated properly, it will react to the advantage of the bleach maker as well, since he will receive information in return which will aid him in his quest for sources of lime which more nearly meet his ideas of perfection.

What Good Bleaching Powder Is

When we speak of "bleaching powder," "bleach," "chloride of lime," or "chlorinated lime," we refer to what should more properly be called "calcium hypochlorite." It is an oxidizing and sometimes a chlorinating agent, made by first hydrating quicklime (calcium oxide) to hydrated lime (calcium hydroxide) and then exposing the hydrate in thin layers on the floors of lead, concrete, or brick chambers to the action of chlorine gas, the chlorine having been produced by the electrolysis of solutions of common salt (sodium chloride).

The resulting white dry powder is then packed into steel drums holding about 750 lb. each and headed up in such a way that they are nearly or quite gas tight. It is then shipped to the paper or textile mill where most of it is used and there stored for days or months in the open. For use, the powder is gently stirred into warm water, the soluble hypochlorite dissolving and the inert calcium hydrate, silica, etc., settling to the bottom of the tank whence it can be washed after the clear supernatant liquid has been drawn off to the machines.

Therefore we say that the necessary qualities to be attained in the manufacture of good commercial bleaching powder are:

1. High grade, i e., an available oxygen content as expressed in terms of so-called "available chlorine," of 35 to 37 per cent.
2. Settling ability, i. e., the rate at which the insoluble portion of the powder completely leaves the clear solution of dissolved hypochlorite.

High Calcium Lime Essential

The matter of grade involves the purity of the quick or bulk lime, and of course harks back to the purity of the stone from which it is burned. I believe that most bleach makers are constantly looking for a burned lime which will have close to the analysis of "A," while "B" represents a more practical standard and one with which most bleach makers may be content.

	A	B
Lime (CaO)	98.10%	94.20%
Magnesia (MgO)	0.30	1.50
Iron & Aluminum (Fe_2O_3,Al_2O_3)	0.10	0.30
Carbon Dioxide (CO_2)	0.50	1.00
Silica (SiO_2)	1.00	3.00
Total	100.00	100.00

A high calcium oxide (lime) content is most essential, as that is the material which when hydrated, reacts with the chlorine gas to form the valuable calcium hypochorite. Not all of the calcium hydrate is permitted to react with chlorine, since a certain amount of "protective alkalinity" is necessary for the "stability" or keeping quality of the powder and the free calcium hydrate usually amounts to from 8 to 16 per cent by weight of the finished bleaching powder.

Magnesia an Impurity

Magnesia (magnesium oxide) is an impurity, the presence of which is usually considered to be deleterious. It hydrates slowly and difficultly, and the magnesium hypochlorite which may be formed on chlorination is by no means as stable as the calcium compound and is calculated to induce decomposition throughout the body of the powder, setting free oxygen and reducing its value during storage. The oxides of iron and aluminum are not directly involved in the chlorination, but are catalysts and cause decomposition out of all proportion to the amounts which may be present. Carbon dioxide resulting from the imperfect burning of the stone should do no harm when combined with lime and when plenty of free hydrate is present, but the result of long experience indicates that the presence of excessive amounts is quite likely to cause very rapid and serious decomposition. Silica is merely a dilutent and has no effect in itself. Small amounts of sulphur trioxide and phosphorous pentoxide are sometimes found, and while they are undesirable from the standpoint of dilution, they are not known to do any particular harm.

The question of "settling ability" seems to be markedly united with the source of the stone from which the lime is burned. Unfortunately there is no published information which may lead the investigator to a method for determining beforehand what a given stone may do. Bulking tests or settling tests on hydrate prepared from a given stone have apparently not been studied sufficiently to permit of any rule being laid down, so the method generally pursued is one of trial in the chambers and under the gassing conditions pertaining to the plant which is investigating the source of the lime. This quality seems to have some dependence too, on the amount of impurity present in the lime. The most notable impurity is magnesia (magnesium oxide) and it has been claimed that an inferior bleach results from the use of burned lime containing over 2½ per cent magnesium oxide. The other common impurities seem to have no direct effect on the settling quality except insofar as they may cause somewhat rapid decomposition of the bleach liquor with the evolution of oxygen bubbles which float up much of the insoluble matter, preventing settling, sometimes for days.

Liquid Chlorine

Although we have been discussing bleaching powder to the neglect of liquid chlorine, the remarks which have just been written apply to the use of lime in using the latter as well. Most of the liquid chlorine which is used for bleaching purposes is allowed to expand into the gaseous condition after which it is absorbed in a suspension of calcium hydrate in water (milk of lime), the amount of lime used per unit of chlorine being about the same as in making bleaching powder. There seems to be a little less interest taken in the physical and chemical qualities of the lime which is used for liquid chlorine absorption as the early use of the finished liquor minimizes the influence of decomposing agents and somewhat more of the insoluble calcium hydrate is used up by the gas.

While the writer has found it impossible to get accurate data together, giving an idea as to the annual consumption of burned lime or quick lime as a chlorine carrier, figures which he believes to be as reliable as any would indicate that it lies between 30,000 and 40,000 tons.

Nashville's Cement Plant Progressing

Hermitage Portland Cement Company Erecting 2000-Bbl. Wet-Process Plant, Straight-Line Design, Concrete and Steel Construction Throughout—Expected to Produce Cement in Latter Part of September

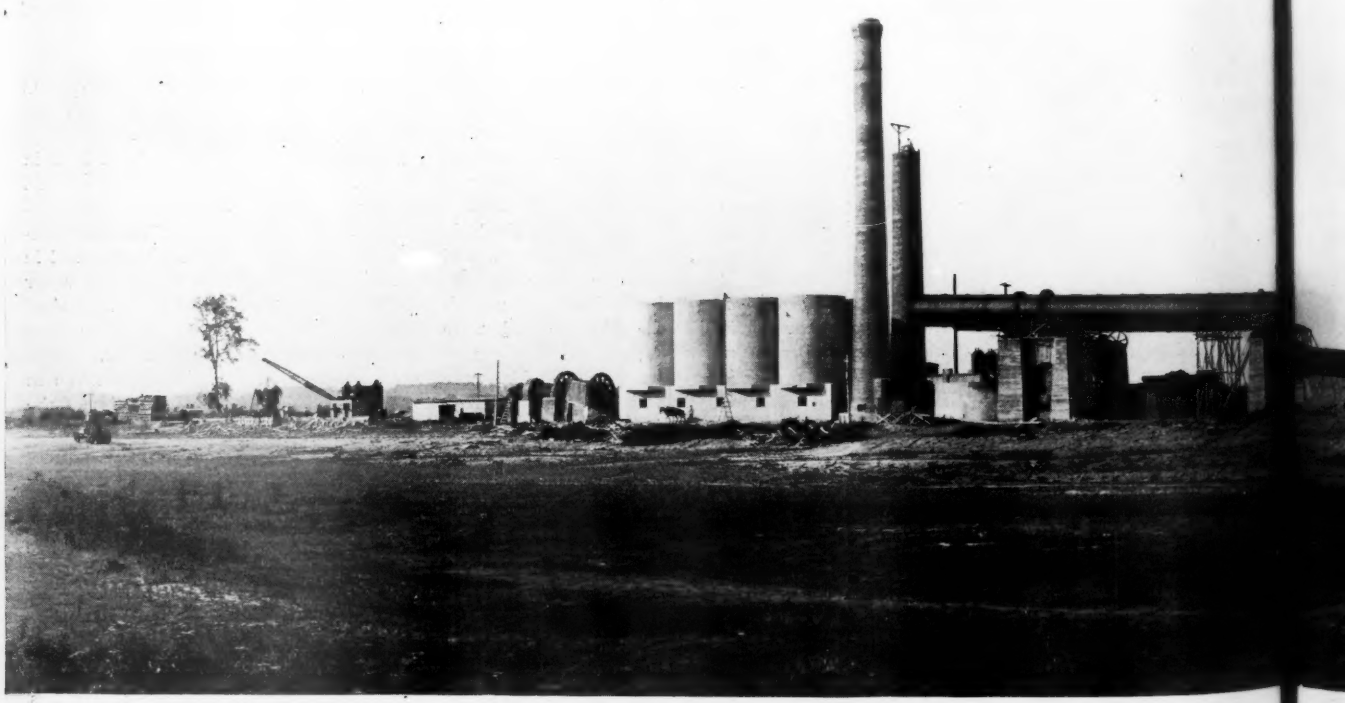
THE Hermitage Portland Cement Co., an organization comprised of business men of Nashville, Chattanooga and other Southern cities, had made excellent progress on its 200-bbl. per day plant near Nashville, Tenn. when a Rock Products representative visited the plant site on July 25. At that time the officials of the company estimated that the plant would be completed and producing cement in the latter part of September.

The plant will employ the wet process and its design is of the straight line type, the course of the material being steadily forward, from the time raw materials are received in the primary crusher until the finished cement is packed into bags. The company is making all the machinery installations and the buildings will be erected above them by the National Bridge Co.

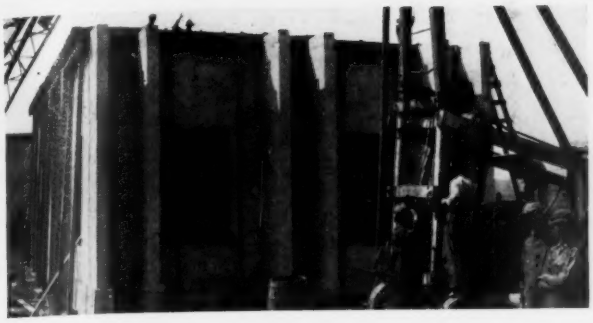
All of the major equipment was on the ground and the greater part of it was on its foundations on the date mentioned. This equipment included two 10x150-ft. kilns with 8x60-ft. coolers; four 7x22-ft. Compeb mills—two each for raw and finish grinding; one 6x22-ft. Compeb for coal grinding; one No. 18 gyratory crusher; two No. 5 gyratories; a 42-in. pan conveyor and a 60-in. by 18-ft. revolving screen. All of this equipment was furnished by the Allis-Chalmers Mfg. Co., Milwaukee.

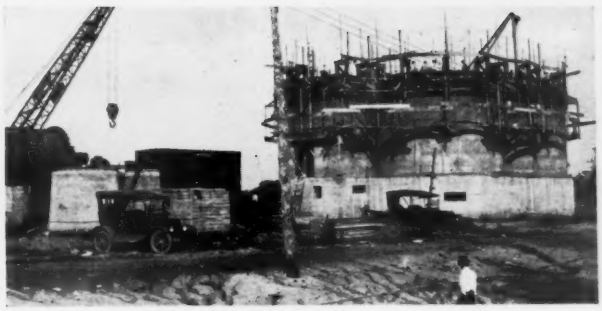
The new company's sack. The original selection of "Old Hickory" as a brand name has been changed to "Hermitage"

A rough outline of the plant's flow



View of the Hermitage cement plant, Nashville, Tennessee,



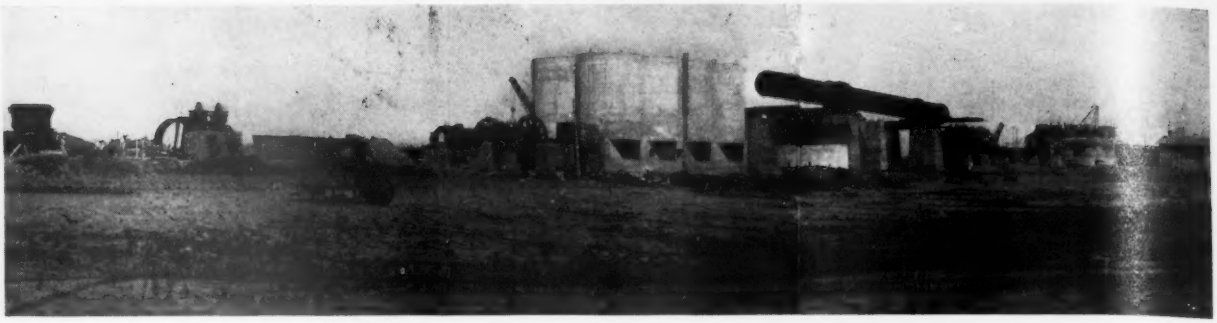


At the left, the generator and electrical control house; right, construction of the four 20x80-ft. silo storage tanks

The No. 18 gyratory and two No. 5 crushers at the Hermitage plant

sheet is as follows: From the No. 18 crusher the stone will be taken to the screen by pan conveyor and the screen's rejection will be returned by gravity to the No. 5 gyratories. The product of these machines will be handled by the same pan conveyor. The screen's undersize will move directly to two Compeb mills or to storage as desired. From the Compebs the ground material will be directed to eight concrete slurry tanks 22 ft. in diameter by 28 ft. high. From these to correction tanks and thence to the kilns. All of this equipment is arranged in a straight line so that the material as it goes through the various processes is always moving forward until it is finally stored in the silos. There are four of these, each 20 ft. in

Tennessee, ... 30, showing progress since the description was written



As the plant appeared on July 25. Most of the major equipment was in place No. 18 and two No. 5 gyratory crushers

diameter by 80 ft. high, having a combined capacity of 40,000 bbl.

Quarry Near Plant

The quarry which will finish the raw materials is about one-quarter mile from the plant. The stone—as well as the shale—will be hauled by steam locomotives and dump cars. At the time of ROCK PRODUCTS' visit the quarry had been opened to a length of approximately 400 ft., and had a face about 25 ft. high. When fully developed, however, officials of the company claim that it will be one-half mile long and will have a 60-ft. face. In view of the fact that there is practically no stripping it is expected that an unusually low quarry operating cost will be attained.

The main offices of the company are at 174 Third street, Nashville, under the direction of R. T. Miller, manager. The officials and members of the operating staff are as follows: President, John C. Vance; vice-president, T. L. Herbert, Jr.; secretary-treasurer, R. D. Herbert; general superintendent, William Fowden, and D. F. Farrar and O. H. Sawdy, engineers.

Big New Crushing Plant on Catalina Island Near Completion

A NEWS dispatch from Long Beach, Calif., states that: "The supply of crushed rock for building purposes in Long Beach will shortly be imported from Santa Catalina, at the rate for crushed rock, stone and gravel of 2500 to 3000 tons daily, with the completion at Pebble Beach, a mile and a half south of Avalon, of a rock-crushing plant to be one of the largest in southern California.

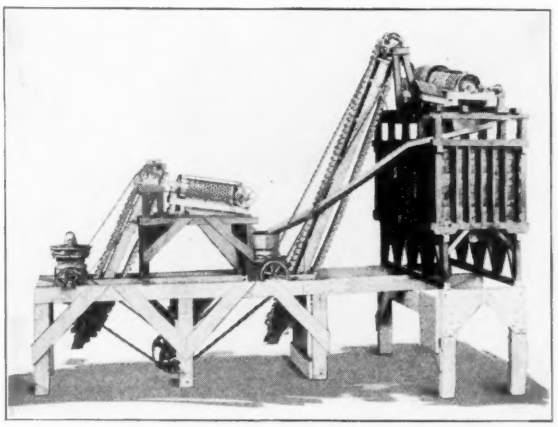
"The first unit of the plant will be in operation in 10 days, according to C. A. Nelson, purchasing agent of Graham Brothers, Inc., of Long Beach, owners, and the last carload of machinery was loaded this week and the entire plant will be going within 60 days. Two hundred men are now employed in the erection of the plant.

"The plant is costing close to $500,000, according to Mr. Nelson, and by reason of the arrangement for the use of the island William Wrigley, Jr., its well-known owner, has become a stockholder in the Graham Brothers, Inc.

"The company already has a fleet of six scows and a towboat in service between its docks in the Craig shipyards and the island, making average daily deliveries of 500 to 600 tons of gravel and rock.

"The Graham Brothers partnership, which was not incorporated until 1921, started from a small beginning in Long Beach in 1909 to an enterprise with a $50,000 a month payroll and owning and utilizing 40 five-ton dump trucks and in its grading and excavation work 37 teams of horses. The firm specializes in sand, gravel and rock and in excavating, grading and hauling.

"The company is preparing to move its business office from 321 East Fourth street to 425 East Fourth, in a building built and owned by the Graham brothers themselves."



Working model of a Telsmith crushing plant

A Model of Crushing Plant That Crushes

THE cut above shows the Telsmith model crushing plant which will be exhibited at the American Mining Congress in Milwaukee, September 24-29. This little outfit is really not a model at all, but an actual operating plant driven by a 1½-hp. motor, reducing granite from 1 in. size down to ¼ in. size and under.

The crushing process will be in two steps. A small edition of the Telsmith primary breaker will do the coarse crushing. This machine is 12¼-in. in diameter, with 2-in. feed opening and 7x2-in. drive pulley. It will be equipped with a complete automatic oiling system similar to that on the regular Telsmith machines.

The coarser rock will be recrushed in a miniature Telsmith reduction crusher to ⅛-in. size. This machine is about 10-in. in diameter with 7x2-in. pulley and ¾-in. feed opening.

This little plant will be equipped with 6-in. scalping and finishing screens, and with continuous bucket elevators equipped with 2¼x1⅛x1½-in. buckets. The bin will be 18 by 18-in by 3-ft. 4-in. with bin gates of corresponding size.

The Telsmith model crushing plant may be seen at Booth No. 99 in the main hall of the auditorium.

New West Coast Lime Company

THE Newcastle Lime Co., Auburn, Calif., has taken over and remodeled the plant formerly operated by the Holmes Lime and Cement Co., San Francisco. This plant was described in ROCK PRODUCTS, October 9, 1920.

The limestone is a crystalline high-calcium stone analyzing nearly 99 per cent calcium carbonate. For many years this was one of the principal lime plants serving the San Francisco market, and in 1920 was the only lime plant in that locality which produced a hydrate.

Lime in Water Treatment Plants

Widening Field for the Use of High Calcium Lime in Municipal, Industrial and Railroad Plants to Soften Water and Remove Turbidity and Harmful Bacteria

By W. D. Collins
Chemist in Charge of Water Division, U. S. Geological Survey
Published by Permission of the Acting Director, U. S. Geological Survey

THE users of lime in water purification are public waterworks, railroads and industrial establishments. Each of these groups has certain requirements which do not necessarily apply to the others. None of them have as yet approached the limit of profitable use of lime. Individual plants in each group are using all the lime they need but a great many more are using none or much less than the quantity that will give the most return for the money spent.

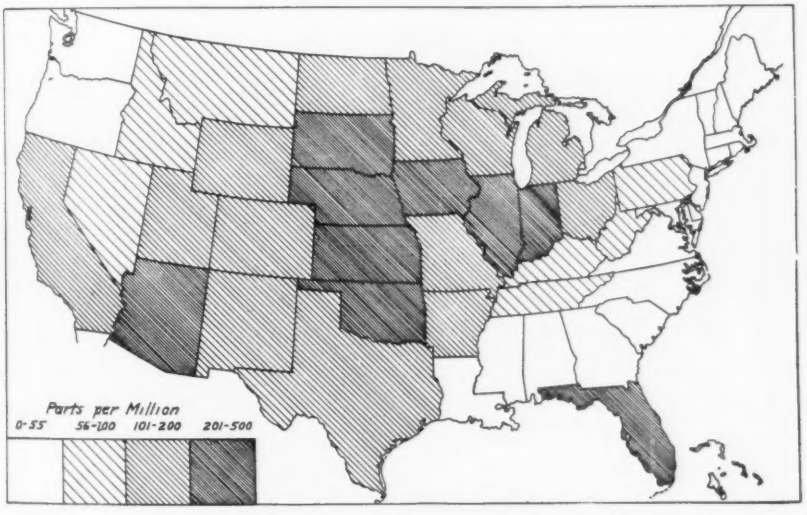


Fig. 1—Average hardness by states, of water furnished by public supply systems in more than 300 cities in the United States. (Plate 1, U. S. Geological Survey Water-Supply Paper No. 496)
Parts per million: Blank, 0-55; light shaded, 56-100 Medium shaded, 101-200; heavy shaded, 201-500

Facts obtained in the preparation of a report* which shows the chemical character of water from the large city supplies in the United States serve to indicate the present and future possibilities for the use of lime in water purification. In this report is given a map which shows the average hardness by states of water from the supplies of the large cities. On this map which is reproduced as Fig. 1, the states shown without shading have soft water. The average hardness† is less than 55 parts per million. This limit is a little over the hardness of the Croton supply of New York City and less than half the hardness of the Chicago water. Comparatively few users of such water find it profitable to put in a softening plant. It is, of course, obvious that hard water is found at many places in the areas shown in white on the map, but the water used by the greater part of those in large cities is decidedly soft.

The states with the lightest shading have water supplies in the large cities that average from 56 to 100 parts per million of hardness. Water of this degree of hardness is called soft by many persons. When the water of a public supply is softened the general practice is to aim at keeping the hardness of the softened water down to about 100 parts per million.

The average hardness of water in cities of the states with medium shading is from 101 to 200 parts per million. Water within these limits of hardness can be softened with profit for almost any use which is affected by hardness. The state of Ohio falls into this class partly because several large cities obtain their water supplies from Lake Erie and Ohio river which furnish much softer water than is obtainable generally throughout the state. In addition the supplies of some cities are softened. The population of Chicago and the other cities in Illinois which use Lake Michigan water is so much greater than the total population of the other large cities in the state that the state as a whole would come in the group with medium shading although many of the cities have exceedingly hard water for public supplies. A small area to represent Chicago and neighboring cities was therefore shaded to show hardness of 101-200 and the rest of the state left to fall in the class of states with harder water.

The states with the darkest shading have an average hardness of from 201-500 parts per million for the water supplied to large cities. These waters are truly hard. It must be noted that at some places in these states soft water is found. The supply at Pensacola, Fla., is one of the softest waters used for a public supply in the United States. Some supplies, in the state, however, approach the other extreme and most of the water available for public or private use is decidedly hard.

Few large cities are able to obtain an adequate water supply from wells. They are compelled to use surface waters from lakes, rivers or impounded streams. Most of these sources are exposed to pollution and therefore purification of the water is necessary. In the earlier purification plants the water was filtered through slow sand filters without the addition of chemicals.

*Collins, W. D., "Industrial Utility of Public Water Supplies in the United States." U. S. Geol. Survey Water-Supply Paper 496, 1923.

†Hardness is expressed as the quantity of calcium carbonate ($CaCO_3$) chemically equivalent to the sum of the constituents of the water which cause the hardness (generally only calcium and magnesium). The part of the hardness due to calcium and magnesium in equilibrium with bicarbonate or carbonate radicles is known as carbonate hardness. It is not far from what has been termed "temporary hardness." The remaining hardness is called non-carbonate hardness and is about the same as the so-called "permanent hardness." In water softening practice it is not uncommon to refer to hardness as calcium carbonate in terms of grains per U. S. gallon. One grain per gallon is 17.1 parts per million. A water with hardness of 3 grains per gallon which is sometimes called "3 grain water" has therefore a hardness of about 51 parts per million.

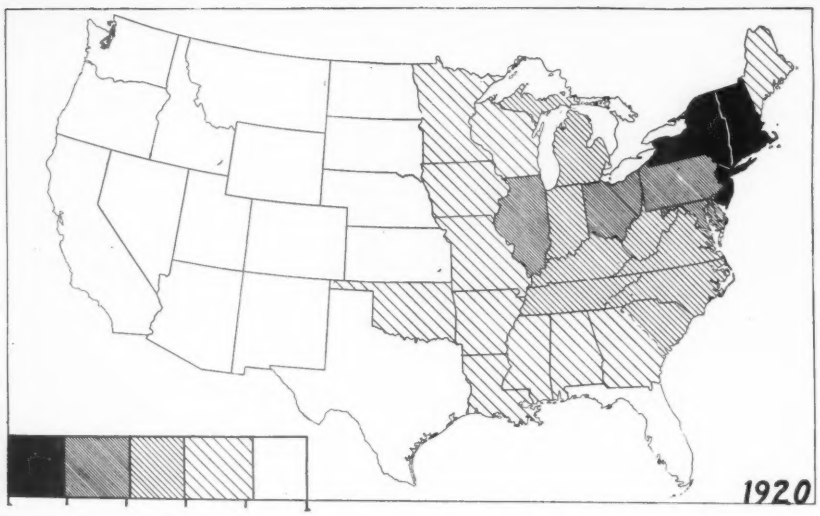


Fig. 2—Density of population. (Based on Fourteenth Census of the United States, 1920)

Population per square mile: Blank areas, less than 25; light shaded, 25-49 Medium shaded, 50-59; heavy shaded, 100-199; black, more than 200

This method of treatment still serves well for a number of waters that are not very turbid or highly colored. The operation of a slow sand filter demands no chemical control and is much simpler than the operation of a mechanical filter with chemical treatment of the water. The tendency in filtration practice in recent years has been towards the more general adoption of filtration combined with chemical treatment. Installation costs are generally less than for slow sand filters and waters can be treated successfully that could hardly be purified practically without the use of chemicals.

The first chemical used generally was alum or aluminum sulphate which forms a flocculent precipitate when added to most natural waters This precipitate makes possible the use of rapid rates of filtration through sand without permitting the passage of harmful bacteria or finely divided silt which would otherwise go through a rapid filter. Throughout most of the shaded area on map 1 it is possible to obtain good coagulation by addition of the proper quantity of alum. With some very soft waters, however, it is necessary to increase the alkilinity in order to obtain a good precipitate with alum. Lime is almost universally used for this purpose. There is then a potential use for lime in connection with alum in the treatment of very soft waters. Lime or soda ash must be used to treat acid waters which are found in a few places. If the water is at all hard the soda ash gives much more satisfactory results, but it costs considerably more.

Lime with Alum and Iron

Alum alone added to a natural water frequently sets free enough carbon dioxide to make the water slightly corrosive. This action causes complaints on account of the so-called "red water" and may make trouble from the corrosion of iron pipes. Lime has been used to prevent this action.

Iron sulphate will make a satisfactory flocculent precipitate for use in filtration if lime is also added to the water. It is possible to add just the quantity of lime necessary to produce the precipitate of iron hydroxide. This will give about the effect of the use of alum except that the water is not made corrosive. If, however, additional lime is added to a certain amount of the carbonate hardness of the water is removed. This partial softening by the use of lime with iron sulphate is practiced at a number of plants where hard water is treated.

The addition of alum or iron sulphate to a water increases the non-carbonate hardness, even if lime is added in sufficient quantity to reduce appreciably the total hardness. Since the non-carbonate hardness is in general more harmful than carbonate hardness soda ash is added to reduce the non-carbonate hardness.

A public water supply obtained from wells rarely requires treatment for the removal of turbidity or of harmful bacteria. Iron is removed from some well waters and a few are softened. The softening of surface waters used for public supplies usually adds comparatively little to the cost of installation of the filtration plant which is necessary to produce an acceptable and safe water. All the equipment for the softening of a supply from wells may be chargeable against the softening process which will make the treatment relatively much more costly than the softening of a surface supply.

So much of the water from a public supply is used for purposes not affected by hardness that it is not profitable to soften it to the extent that water is softened for industrial use. Therefore, even if all the public supplies in the hard water areas shown on the map were softened there would still be a large amount of softening of water for industrial use.

The relative areas shown in Fig. 1 may be misleading if consideration is not given to the distribution of population and industrial activity. Fig. 2 shows that over 60 per cent of the total population of the United States live in the states east of the Mississippi river. The softening of sur-

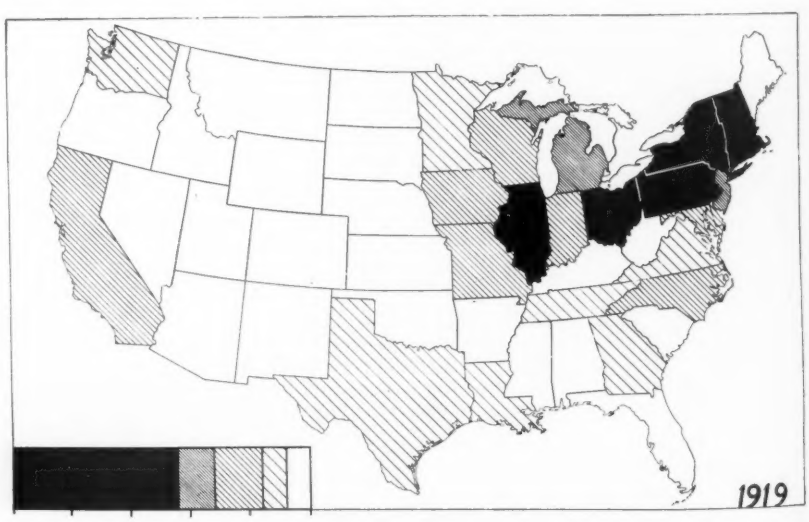


Fig. 3—Industrial activity, by states, in 1919. Value added by manufacture for all industries. (Based on report on Manufactures, 1919, Fourteenth Census of the United States)

Value added in $100,000,000: Blank areas, less than 2; light shaded, 2-4 Medium shaded, 4-8; heavy shaded, 8-16; black, more than 16

face water which is to be used for public supplies is thus seen to be relatively less important than would be expected from a glance at the relative areas of soft and hard water regions.

Railroads

The growth of water treatment by railroads has been rapid in recent years. When labor, fuel, and materials were cheaper the savings from the improvement of boiler feed water were not so noticeable as at present. Railroad traffic in the hard water areas has also increased greatly.

A city must obtain its water supply within a reasonable distance, but the large cities of the United States are generally in regions where water is not very hard. A manufacturing plant can be located where soft water is available unless other factors make it cheaper to treat a hard water for use in the plant. A railroad locomotive must obtain water from the country through which it travels and it can be seen that some systems or units of railroad operation are almost wholly in the areas of hard water. All the transcontinental railroad systems, therefore, are potential users of lime for water treatment. The softening of water for railroad use is practically all done by the use of lime and soda ash.

In Fig. 3, which is based on data from the 1920 census of manufactures, the industrial activity of states or groups of states in 1919 is indicated by the shading. The states of Connecticut, Massachusetts, New Hampshire, Rhode Island, and Vermont are considered as one unit; Delaware, District of Columbia, and Maryland are taken together as another unit. The shadings are proportional to the item called in the census report "value added by manufacture." This is the difference between the value of finished products and the cost of materials. It thus avoids the duplication involved in consideration of the value of manufactured products which may count the same item many times. The finished product of one factory may be part of the material used in a second plant to make something which is again used in making another product. Value added by manufacture is counted only once for each step in connection with the production of any article.

The lightest shading represents the addition by manufacture of between $200,000,000 and $400,000,000 to the value of articles produced in each state or group so shaded. The next two darker shadings represent from $400,000,000 to $800,000,000 and from $800,000,000 to $1,600,000,000 added by manufacture. The black areas show the states or groups in which the value added by manufacture in 1919 was over $1,600,000,000.

The diagram at the bottom of Fig. 3 shows that the five units shaded black had nearly 60 per cent of the industrial activity in the United States in 1919 as measured by the value added by manufacture. The unshaded states all together gave hardly 10 per cent of the value added by manufacture. These states make up a considerable part of the area of hard water as shown in Fig. 1.

At some plants water for industrial use is treated with a coagulant and filtered like a surface water purified for a city supply. The great majority of industrial treatment plants, however, are installed for softening water to be used in steam boilers or in the various processes of manufacture.

Lime is used in the lime-soda system of softening water for industrial use. For many plants this system is the most suitable. In certain processes like dyeing or laundry work it is desirable and almost essential to have the hardness removed more completely than is possible by treatment with lime and soda in the cold. Exchange silicate or so-called zeolite softeners are used to secure this extreme softness of water. If the water to be softened is only slightly hard it may be cheaper to use the exchange silicate softener. It is not so cheap for the very hard water.

The field for the extensive use of lime for water softening in industrial plants can be seen from a comparison of Figs. 1 and 3. Here as with the municipal treatment there are large areas where hard water is found that do not offer much opportunity for the use of lime in water treatment.

Quality of Lime for Water Treatment

Lime for use in water treatment must be high calcium lime of the best quality. Magnesium has no value and is considered by some to be actually detrimental in the process instead of merely inert like silica or unburned stone. All inert material is not only useless but adds to the quantity of sludge to be handled, which is a distinct disadvantage at some plants.

Quicklime is generally used at waterworks. The operation of the plants is under constant chemical control and lime is used in such quantities that it is not kept long at the plant exposed to deterioration through air slaking.

Hydrated lime is almost universally used for water softening by railroads and industrial plants. The advantage of the finely divided condition and constancy of composition in storage more than make up for the extra cost of the hydrated lime including the payment of freight on the combined water.

Future Demand

The demand for lime for water treatment is bound to increase greatly. More waterworks will install filtration plants which will require the use of lime to assist coagulation. Plants now in operation in the hard water area and new ones to be installed will more and more adopt softening as part of the treatment of public supplies. Railroads are at present installing many new plants for softening water. Census reports show that the center of industrial activity has moved westward ever since the census of manufactures was started. This movement must continue and it is into the area of hard water. In the places where the water is hardest the lime-soda treatment has the greatest advantage over the exchange silicate softener. The increased costs of fuel and labor have hastened the adoption of water softening as a money-making device for railroads and industrial plants.

There is a large and rapidly-growing field for the sale of lime for water treatment open to those manufacturers who can deliver lime of exceptional purity. Less pure lime which may be equally valuable for many uses cannot compete in this field with the very pure grades which alone are economical for water treatment.

Making "Stone Tile" in California

THE Pasadena (Calif.) *Star-News* has the following description of the manufacture of stone tile, which is a comparatively new concrete building material, made by the Pacific Tile Co. of Pasadena:

In casting Stone-Tile the concrete is mixed and poured into the molds in a plastic state, thus insuring uniform density in the finished product. The manufacturing process is accomplished with as little labor as is required in the pouring of concrete sidewalks. No pallets are needed and excessive labor of ramming dry concrete as well as the uncertain results of dry tamp methods are eliminated. The molds are stripped from the newly made brick immediately after the top is surfaced, as it is not necessary to wait for the brick to set before lifting the mold and moving it into position for the next pouring. The process is the outcome of years of experimenting and because of its efficiency is attracting widespread attention.

New Gravel Rates in Alabama

THE *Banner* of Nashville, Tenn., prints the following dispatch from Montgomery, Ala.:

General reductions in gravel rates to points in Montgomery county from Cantelou Spur were ordered by the Public Service Commission today. The order will save the county several thousand dollars annually. New rates will be 65 cents from Cantelou to Wiley and Snowdoun and 60 cents to all other points. The old rates ranged from 59 cents to 83 cents. The commission's order will be effective in 30 days and will involve the Western of Alabama and Atlantic Coast Line railroads.

General view of the new wet-process plant of the Lehigh Portland Cement Company at Birmingham, Alabama, recently completed

Lehigh Company's Sixteenth Plant Completed

Dwight P. Robinson Co. Establishes a Record for Wet-Process Plant Construction, Completing This 1,500,000-Barrel Mill in Nine Months —All-Steel and Concrete Construction—Designed by Company's Own Engineers—Well Situated with Respect to All Raw Materials

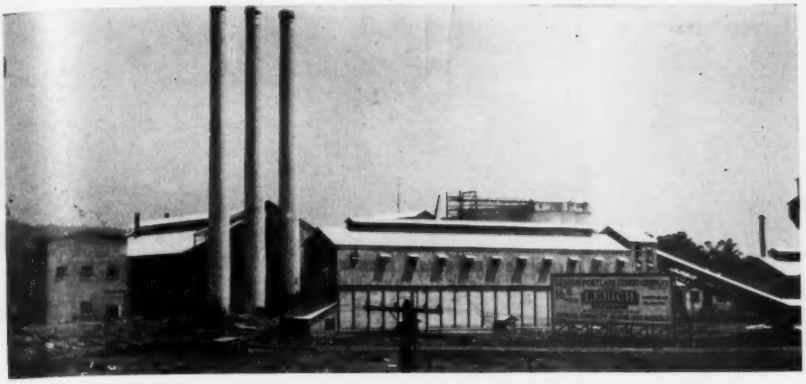
THE Lehigh Portland Cement Co.'s sixteenth plant, located at Birmingham, Ala., has been completed. Ground for this unusual plant was broken on November 20, 1922, and clinker was made on August 6 last—a period of eight months and seventeen days from the time work was started until clinker was produced. This is a record for wet-process plant construction and was established by the Dwight P. Robinson Co., New York, which drew up the plans and did all the construction work. The plant as a whole was designed by R. R. Bear, the Lehigh company's chief engineer; the Robinson company drew up only the final detailed plans and executed the construction work.

Unusual aeroplane photograph obtained two months prior to plant's completion

The Lehigh interests were looked after, during the plant's erection, by R. H. McFetridge, formerly general superintendent of the company's plants Nos. 1 and 2 at New Castle, Pa. Mr. McFetridge will be responsible for the successful operation of the plant. T. C. Straun was in charge of the construction work for the Robinson company.

The new plant is located in North Birmingham on a tract of approximately 475 acres and is served directly by the Louisville & Nashville and a belt line, the latter connecting of course with all railways serving the Birmingham district. In addition to having such a splendid railway outlet, the plant is only a half mile from a concrete road, thereby affording delivery by motor truck to the city, the heart of which is but eight miles from the plant.

Shale pits are but a fraction of a mile from the plant and this material will be hauled over the company's own track to the plant. Coal will be purchased from the Alabama Coal Co., whose mines are at Lewisburg, seven miles distant. Since the stone quarry is but a stone's throw from the crushing plant, the company therefore has chosen an ideal location for its plant inasmuch as the three most essential materials for the manufacture of cement are at its back door. This will make possible, it is claimed, one of the



View obtained from opposite side showing stone and shale storage building in the foreground; substation at left

lowest production costs yet attained by a wet-process plant.

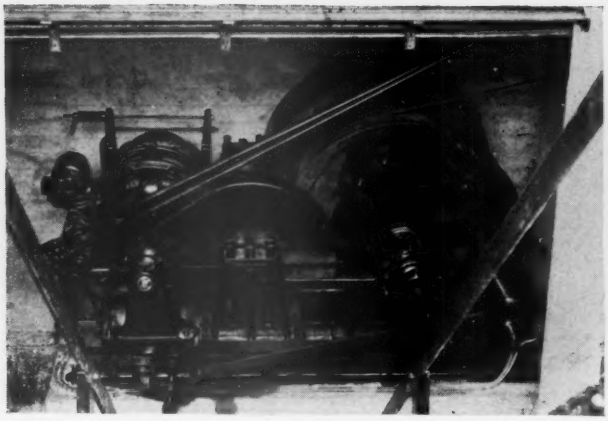
The fact that the Lehigh company has built a wet-process plant at Birmingham and that the Phoenix company has erected one not two miles away employing the dry process has been a subject for considerable comment on the part of many men of the cement industry, for few are aware that both companies were justified in their selection. Some have asked, "If the Phoenix company can manufacture a cement that is up to specifications by the dry process in the Birmingham district, why can't the Lehigh company?" While others have been of the opinion that if it is necessary that the Lehigh company use the wet process, it is also necessary that the Phoenix company employ it. For the benefit of those who have not read the article describing the Phoenix plant which appeared in Rock Products of August 25, it may be said that both companies in choosing the process considered the quality of the raw materials. Officials of the Lehigh company claim that so far as uniformity in chemical composition of the shale is concerned, their deposit is as good or better than the shale on the Phoenix property. The reason that the Lehigh officials adopted the wet process was because of the nature of their material, which is a very decomposed shale, rather difficult to handle in wet weather in a dry-process mix.

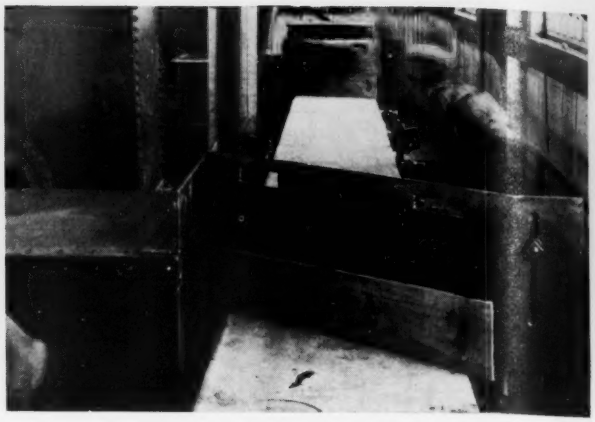
Cement *can* be manufactured from materials containing a high percentage of moisture by the dry process, but it can not be done economically. This is because so much equipment would be necessary to properly blend the materials that maintenance costs alone would reduce the margin of profit to a figure that would not permit the operation to continue. The process affords a positive mix control, whereas the dry process is dependent to a certain degree upon the uniformity of the raw materials.

There are several advantages claimed for the wet process while there is but one point in favor of the dry method. The latter is chosen, where the nature of the raw materials permits, because considerably less fuel is required for burning. It is admitted by many authorities, however, that the wet process affords a more uniform mix under all conditions and that a more constant composition can be maintained because the particles of raw materials can be brought into more intimate contact. Also, wet materials can be ground more easily than dry materials, thereby requiring less power and reducing maintenance costs. Another point in favor of the wet process is that it requires no drying equipment, thereby effecting a saving in initial cost of plant and in fuel, labor, power and maintenance costs. It is also claimed that clinker of the wet process is more easily ground than that of the dry process, and that there is less dust connected with the wet process than with the dry.

Temporary crushing plant which crushed all the stone used in the new plant's construction

At the left, the storage yard for loaded and empty quarry cars, scale house and control house; at the right, one of the locomotives with a string of cars going to the shale pits





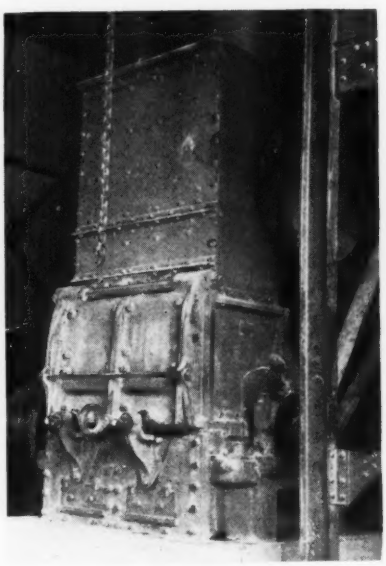
The big single-drum hoist at the right is mounted underground for pulling loads out of the quarry; at the left is shown one of the scrapers which feed the kominuters in the raw-grind plant

It should be understood, therefore, that the Lehigh company selected the wet process because the nature of the shale compelled its use in order that a quality cement could be manufactured economically.

The quarry which will serve the plant is being opened in pit fashion to a depth of 35 ft. and is approximately 200 yd. from the foot of the incline leading to the crushing plant. Loading is done by steam shovels into six-ton steel cars of special construction which are pulled up an incline of 30 deg. by a single-drum hoist fitted with ⅞-in. cable and powered by a 100-hp. motor. The hoist is mounted under the tracks at the top of the incline in a concrete-walled subway and is controlled from a house on the surface by means of extended levers.

As the cars reach the top the pulling line is detached and they move by gravity to track scales. The scales are of the automatic-dial type and are mounted in a small concrete house located between two sets of tracks—one for stone and the other for shale. These afford an accurate record of all raw materials entering the plant.

The incline leading from the ground level to the hopper floor of the crusher accommodates two tracks each of which is served by heavy-duty single-drum hoists, each powered by 100-hp. motors set up on the ground floor of the crushing plant. These pull the cars over and beyond the primary crusher, bringing them in contact with a device which automatically dumps them directly into the crusher. As the cars are dumped they are returned to a track on the ground level paralleling the scale tracks. From here they are pulled to the top of the incline, preparatory to being put in the quarry again, by a small single-drum hoist powered by a 5-hp. motor.

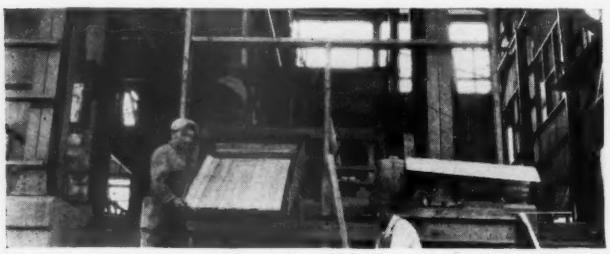


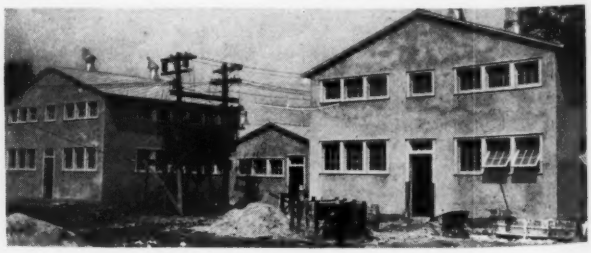
One of the two secondary crushers. It is a 42x48-in. swing-hammer pulverizer

The crushing plant building is 60 ft. wide, 70 ft. long and towers 81 ft. in height. It is of concrete construction having a structural-steel frame covered with heavy corrugated steel. All of the stairs —and there are a great many—as well as landings and platforms are constructed of steel grating. This feature is embodied in all the buildings of the plant.

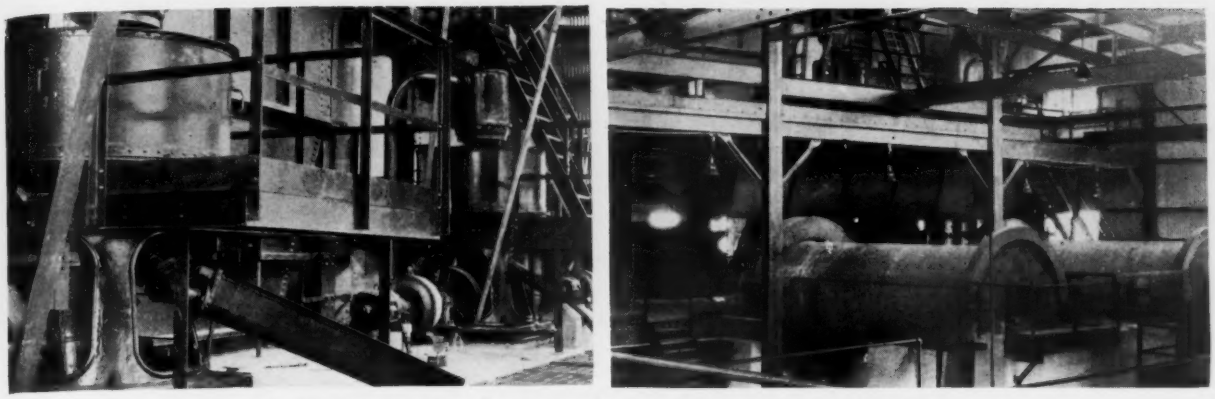
Primary crushing is done by a 42-in. gyratory crusher driven by a 200-hp. motor. This machine's product is divided before leaving it in such a way that half of it discharges at one side and the other half at the opposite side. The discharge point of the crusher is about 8 ft. above the lower-floor level so that it discharges directly into the secondary breakers, the bases of which are at floor level. The initial breaker discharges at 5 in. and the two secondary crushers—42x48-in. swing-hammer pulverizers—are set to discharge at 1 in. Each swing-hammer mill is driven by a 200-hp. motor and empties on a 30-in. belt of 139-ft. centers leading to a storage building.

The stone-storage building is 215 ft. long by 31 ft. wide and is provided with two 24-in. underground belt conveyors running its full length. These are mounted in spacious concrete-lined tunnels so that they can be attended and repaired easily. They empty on one 30-in. belt of about 250-ft. centers, operating on an incline of 18 deg., which leads to the raw grinding department.



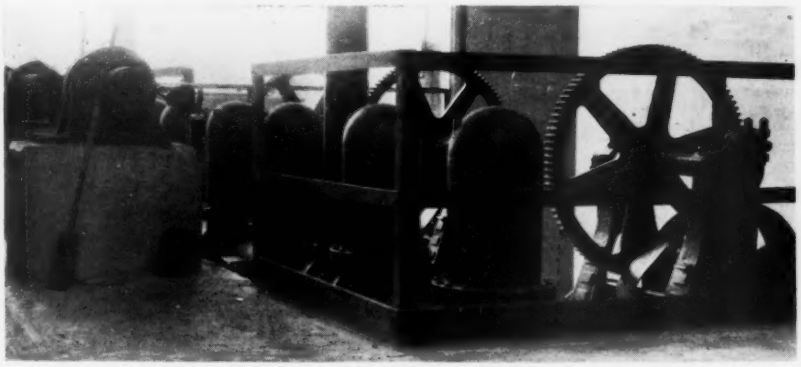


Interior of the packing room; at the right, the change houses which are equipped with shower baths and locker for both white men and negroes



At the left, the three classifiers; right, the slurry feeder and tube mills

The building housing the raw grinding equipment is practically square, measuring 111x113 ft. The roof covering the kilns joins its roof, giving the appearance of one large L-shaped building. The conveyor leading from the stone storage passes by three kominuters and at each one is provided a scraper device for removing each one's proportion of the mixed stone and shale. These machines are driven by 150-hp. motors and their products are elevated to three trix classifiers. The rejections from the classifiers pass back to the kominuters while their products move to an agitator, or slurry feeder.



Something new for cement plants. These pumps handle the slurry from the mixing basins to the kiln feed tanks

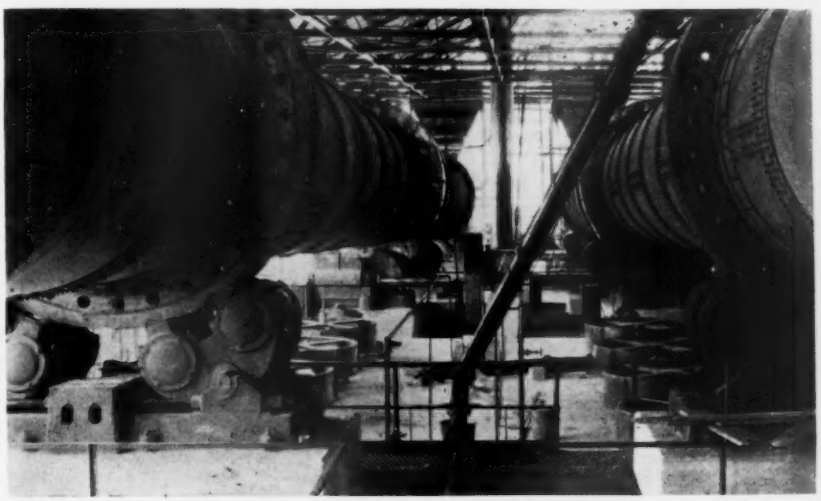
As the wet material leaves the agitator half of it is directed to one tube mill and the other half to another. The two tube mills are 7 ft. in diameter by 22 ft. long and are powered by 300-hp. motors. From them the mix is moved to a series of concrete mixing basins and from these to correcting basins. All of the tanks are below the feed level of the kilns. Their contents are pumped by slurry pumps, of which there are three, each driven by a 10-hp. motor. The pumping system is the first of its kind installed in a cement plant and is expected to serve more satisfactorily and economically than the usual system comprised of conveyors and elevators.

Each of these three kilns, which are 11 ft. 3 in. in diameter by 190 ft. long, are provided with small tanks at the feed end so that if the slurry, at the time it reaches this point, is not found to be of the proper composition, it is possible to add a mixture of slightly higher or lower composition, as the case may require.

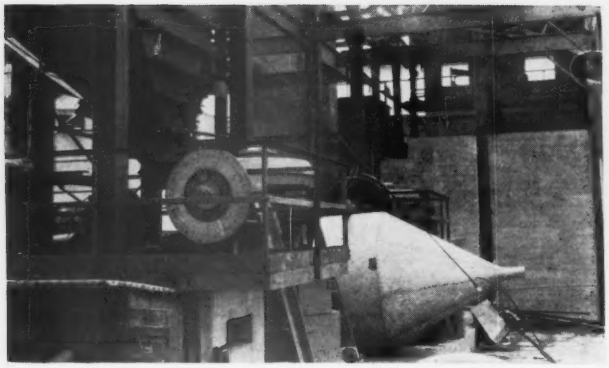
The kilns are equipped with 7x60-ft. rotary coolers and the clinker is removed by a chain drag conveyor. The conveyor can be made to empty either into storage or directly into a conveyor serving the clinker grinding plant. The storage space for clinker is 81 ft. wide, 220 ft. long, having 22-ft. concrete walls and a concrete floor. Recovery from the clinker storage is effected by a 24-in. pan conveyor leading direct to individual steel bins serving the primary grinding equipment. An 80-ft. span electric crane equipped with a 3-yd. bucket operates in the coal and clinker storage.

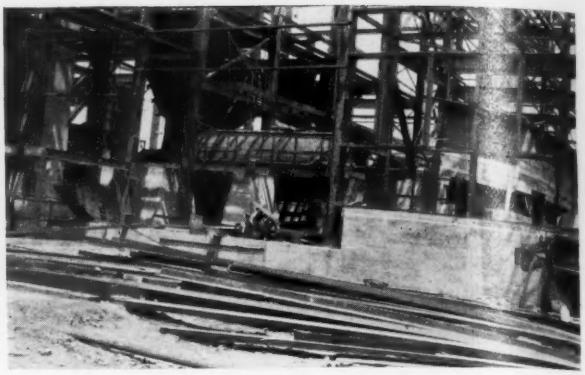
Grinding equipment in the finish-grind plant consists of two Griffin model preliminary grinders powered by 200-hp. synchronous motors, and three 7x22-ft. tube mills powered by 300-hp. motors. These machines empty into a screw conveyor which in turn empties in a bucket elevator of 96-ft. centers. The elevator discharges on a belt conveyor mounted in a steel gallery connecting the grinding plant with the silo storage tanks.

There are 10 silos for the storage of the finished product, each 32 ft. in diameter, inside measurement, and 70 ft. high. They cover an area of 11,600 sq. ft. and have a combined capacity of 175,000 bbl. In a straight line with the silos are the packing



Two of the three 11-ft. 3-in. by 190-ft. kilns

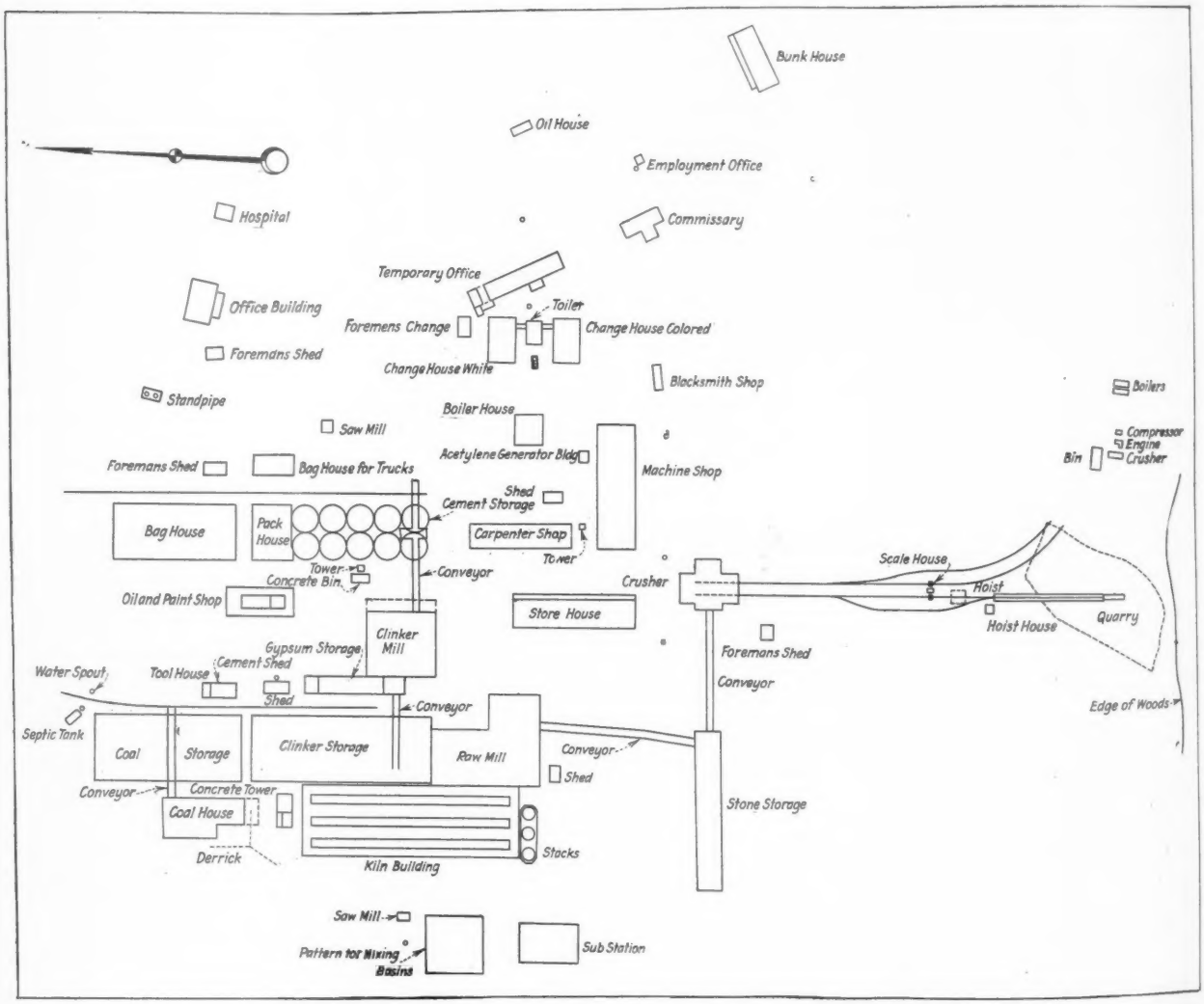




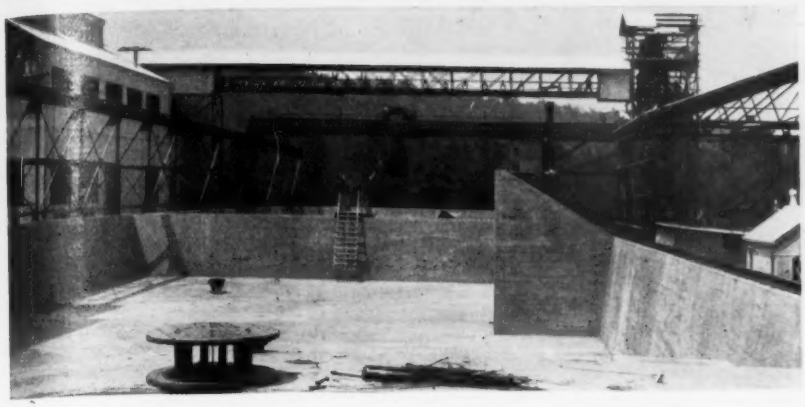
Installing the preliminary grinding mills in the finish-grind department; at the right, the tube mills as they were being installed

and bag houses, both 66 ft. wide; the former is 50 ft. long and the latter 150 ft. The packing house is equipped with four of the latest model three-spout valve-bag packers. The loaded bags from two of these machines are conveyed by a 28-in. belt conveyor to a loading track on one side of the building while the other two machines' products are carried on a belt of the same size leading to a loading track on the opposite side. The main screw conveyors leading from the silos to the packing machines' bins are powered by 25-hp. motors. In addition to the packing house there is another building for packing for the motor-truck trade.

An unusual feature of the plant is that it is equipped with a heating plant. This unit will furnish steam heat to all the buildings about the plant, including the general office building, hospital and change



This drawing gives an idea of the general layout of the plant



The clinker storage; at the rear the coal storage, 80 ft. wide

rooms. It is of concrete construction, 35 ft. square, and has a 75-ft. concrete stack. Other buildings about the plant are: Storehouse, 40x150 ft., where all repair parts, tools and miscellaneous equipment are stored; two change houses, each 33x53 ft., for white men and negroes to change clothes, bathe, etc; a building 30x90 ft. housing the carpenter and electrical repair shops; a machine and blacksmith shop, measuring 47x150 ft., fully equipped for repairing the largest piece of equipment in the plant; an oil and paint building, 32x90 ft., located on the main siding, having a loading platform; a small hospital building and a general plant office.

Power is obtained from the Birmingham Railway Light and Power Co. and is received at the company's primary substation at 13,000 volts where it is stepped down to 2300 volts. From this station it is distributed to the various departments, all of which are equipped with individual substations for reducing to the desired voltage.

At the time of the visit of a Rock Products representative on August 1, the officials expected to have the plant completely finished and shipping cement on September 1.

Announcing the Schaffer Engineering Company

JOHN C. SCHAFFER, formerly president of the Schaffer Engineering and Equipment Co. and of the Schaffer-Alles Chemical Co., has taken over the sole rights for the manufacture and sale of the Schaffer lime hydrator and the engineering business of the Schaffer Engineering and Equipment Co. Mr. Schaffer is now associated with W. J. Kuntz, of York, Pa., in a new company known as the Schaffer Engineering Co., with headquarters in the House building, Smithfield and Water streets, Pittsburgh, Pa.

Mr. Kuntz is well known to the lime industry as the former general manager of the Stacy Schmidt Manufacturing Co. and later of the McGann Manufacturing Co., both of York, Pa., manufacturers of lime kilns and lime-plant equipment. Of course, Mr. Schaffer needs no introduction to Rock Products readers, for he was the engineer of several of the lime industry's most notable plants, including that of the Ohio Hydrate and Supply Co., Woodville, Ohio; the Knickerbocker Lime Co., Devault, Pa.; the American Lime and Stone Co., Bellefont, Pa.

Mr. Schaffer writes Rock Products: "We will be entirely free from the influence of machinery interests and will employ the same policy that was responsible for the phenomenal growth of the Schaffer Engineering and Equipment Co. up to 1919. It is our intention to devote our energies to the lime industry and the developing of lime manufacturing methods to the highest point of efficiency, and the handling of lime on the most scientific lines. We are bringing out some new features that will tend to advance the lime industry still further than those already employed by our organization."

The Schaffer Engineering and Equipment Co. will continue as heretofore with its present address, 2828 Smallman street, Pittsburgh, Pa., and will devote its entire efforts to the manufacture and sale of the Schaffer poidometer.

Where 175,000 bbl. of finished cement can be stored

Cheswick Sand Plant Destroyed by Fire

THE Cheswick plant of the Peerless Sand Co., Springdale township, was destroyed by fire recently which raged for more than five hours. Damage was about $90,000.

The blaze, the origin of which is undetermined, was discovered after the employes had left the plant. The flames spread rapidly from a large one-story frame building to three large conveyors and loaders. Before the fire engines from New Kensington, seven miles away, arrived the fire had gained such headway that the firemen were unable to cope with it.

The blaze was discovered by J. B. Huber, an employe, who resides nearby. It is said by officials of the company that the plant will be rebuilt immediately.—*Pittsburgh, Pa., Press.*

Pennsylvania Quarries Short of Labor

ALL qualified miners can readily be placed providing they can pass the state examination. The supply of applicants for this work is limited. Those who do apply are mostly from the Southern states. Quarries are unable to operate fully because experienced and reliable help cannot be procured. Several have closed down for an indefinite period because enough help could not be procured to operate on a profitable basis.—*Harrisburg, Pa., Patriot.*

A Correction

IN the news item on page 48 of the August 28 issue of Rock Products announcing changes in the organization which manufactures the new lime plaster hardener, "Piercite," H. H. Pierce was referred to as the inventor. The inventor of Piercite is D. M. Harrison, chemical engineer of the Alles-Harrison Chemical Co.

Quarried from Life

By Liman Sandrock

Now He's Grandpa Sandles!

JUST one glance at the picture below and you'll feel sure you have the whole story—if you are a granddaddy yourself. If not—say, you don't know the half of it, brother!

It isn't given to the most of us to rise to the exalted position recently attained by Secretary A. P. Sandles of the National Crushed Stone Association. It is quite universal, and quite in order, for us to be nominated and elected papa of the House, even if we are not always entitled to be called its speaker. We personally have taken our part in the debates that have been before the house—and as usually happens, defeated by an overwhelming majority. But we have never been a grandfather—yet!

"A little Child shall lead them," says Holy Writ—and how wonderfully true it is in our family life. You will never forget the moment when your little one was placed in your eager arms, will you? We'll say not, all of us fathers!

But what must it be—years after you cuddled that baby to your heart—when that one-time baby becomes a parent? Parenthood is a wonderful and, in a way, a beautiful mystery, ever thrilling and filled with joy. To be a granddaddy—well, ask Brother Sandles!

Grandpa Sandles, ROCK PRODUCTS is delighted to learn that your daughter has so signally honored you and we prophesy that, in the course of time, the prefix "great" will be added to "grandfather." It has happened to some of us, why not to you?

He Trod the Sand and Gravel Path

IF you still remember your Horatio Alger and your Henty, you will recollect that your favorite boy hero always first appeared on the scene as a sturdy, bright-eyed youngster of 10, or a snappy, nippy little kid who wore a happy smile for his newspaper or his shoeshine patrons and was tickled to death to please everybody. Let us try to emulate these boyhood authors by introducing our hero in similar fashion.

Down in Cleveland, Tenn., which is some 20 miles from Chattanooga, in the early '80's, a sturdy boy, tanned by the summer suns and tough as nails from climbing the mountain trails barefoot, was his dad's sole assistant in laying the first batch of concrete ever mixed in that Southern town—and the job was the county jail. He was H. L. Bible.

Like all well-regulated county seats, Cleveland must have a jail. Not that the Clevelanders themselves needed this restraint, but the evil-doer naturally gravitates to the city gates seeking whom he may do, and the city fathers must give him suitable shelter. Naturally, a boy who bears the patronymic of Bible will soon find that such contact with the local bastile most grewsome, even before it begins to function. Our boy had had enough.

In his early days he attended the grammar school. Then followed the high school

"Grandpa" Sandles

and later a course at a business college at Knoxville. His early induction into the sand and gravel business gave him a taste for the business, and therefore on his vacations he still continued under his father's guidance.

At the age of 21 we find him in business at Bridgeport, Ala., when that town was laboring under the throes of "the boom days of 1872." Somehow, that word "boom" is usually the forerunner of failure, and it proved so in Brother Bible's case.

Undaunted, however, he went to Chattanooga and founded the Bible Sand Co., starting, as he told us, "with $1000 minus, a blind horse, a spavined mule, a second-hand army wagon—and with my office in my coat pocket."

He paid a boy 75 cents a day to drive the team, loading the sand with a long-handled shovel and then delivering the load to the job. His output was about 5 yd. a day.

Gradually, Mr. Bible added to his equipment until, in 1911, he had completed a plant on the Tennessee river having a capacity of 500 yd. of washed and graded sand and gravel per day. Later, owing to ill health, he sold this plant to the Dixie Portland Cement Co.

After regaining his health he opened a sand and gravel operation at Saulsbury, Tenn., and then turned it over to his son. His next endeavor was to build the Carolina Sand and Gravel Co. plant at Carthage, N. C., acting as its vice-president.

Selling out this plant, he bought an interest in the Alabama Sand and Gravel Co. at Montgomery, Ala., taking over the general managership. Mr. Bible today is formulating plans which are well on their way and is building an additional unit that will more than double his company's present capacity.

"Wisdom," says Wordsworth, "is oftimes nearer when we stoop than when we roar," and undoubtedly Mr. Bible first began his cultivation of that quality when he stooped and toiled over his first venture at Chattanooga—$1000 minus, a blind horse, a spavined mule, and my coat-pocket office."

They Said It

A REALTY COMPANY in Camden, Ark., offers a reward of $1000 for any one who can show them a town with greater future possibilities than theirs. We remember reading that Ar-kan-saw is the French rendition of the Sioux "U-gakh-pa," meaning "Down-stream people." A friend of ours recently forded an Arkansaw down-stream highway in his lizzy which had a $10,000,000 possibility.

A. W. SCHMIDT, superintendent of the Diamond Sand and Gravel Co., Bedford, Ohio, says that, with a former type of screen used, "We had men pounding the screens with baseball bats—and we used to wear out the bats at a tremendous rate." Now, they're batting home runs over the fence.

PENNSYLVANIA SLATE PILES remind Brother Smith of the North Bangor Slate Co. of the waste coal dumps in the Scranton district. "If we had about 1 per cent more carbon in our slate," he more or less facetiously remarks, "we could dispense with the stuff they now ship out of Scranton." Quarry slate already carries about one-half of 1 per cent carbon—a fact that can't be wiped off the slate.

A. L. THUNDER is the manager of the Hastings Gravel and Construction Co. at Battle Creek, Mich. What saith Shakespears in "Coriolanus," "His nature is too noble; he would not flatter Jove for his power to thunder." The Bard of Avon evidently did not know of Battle Creek or he would have said something about it.

Editorial Comment

The Japanese Catastrophe

Rock products operators and manufacturers of plant machinery and equipment in America feel genuine and deep sympathy for our Japanese brethren, who have suffered a disaster far greater than any similar disaster in recorded history. We extend our own sympathy and encouragement both here and by letter to our several Japanese subscribers and readers, and we urge the industry that we represent to be liberal in contributions for relief as well as in sympathy. While the islands of Japan at present seem peculiarly likely to earthquake shocks, we can never tell where they will occur. Charleston, S. C., Madrid, Mo., San Francisco, Calif., have all had disastrous earthquakes even within the short period of history of this United States—so we can never tell where the blow will fall next, and it behooves us to remember the Golden Rule "to do unto others as we would be done by."

Publicity for Rock Products

This issue contains an unusual amount of material on the uses of lime in the chemical industries—consisting largely of original contributions by some of the best known chemists in their respective industries in the world. The reason for this special effort is that the editors of Rock Products are co-operating, as they have done for the past three years, with the National Lime Association in giving useful and helpful publicity to lime and in aiding to build up an authoritative literature on the uses of lime. This issue of Rock Products will be available to all visiting chemists at the booth of the National Lime Association at the National Exposition of the Chemical Industries in New York City the week of September 17 to 23.

Also, this issue will be distributed at the booth that Rock Products will have at the National Exposition of Mining and Mining Equipment at Milwaukee the week following. At both expositions producers of rock products will come in contact with other great industries which are closely allied to the rock products industry, and it is the earnest desire of the editors to make this issue of Rock Products a fair representative of a great and growing industry.

So in this issue we have hit some of the high spots and most recent developments in several of the major rock products industries. Our chief regret is that limitation of space prevents our publishing a great deal of other particularly relevant matter that we should have liked to include in this issue. However, we have given enough to impress any man of science with the fact that the rock products industry constitutes a field worthy of their attention, and well worth exploitation.

European Research in Concrete

Rock Products perhaps stepped a little aside from its proper field when it secured the article by Dr. Platzmann on "Porous Concrete," but it felt justified in doing this for the reasons given in the editorial note accompanying it. At present, European research in portland cement and concrete seems to have a long lead over American. Europeans were slower in adopting concrete construction on a large scale, because skilled labor in the building trades was abundant and cheap over there. But conditions have changed since the war and concrete is in greater favor. It is natural that the thoroughly trained minds of European technicians should bring forth much that is new and important. They seem to have been very successful in the concrete products field. One reads of flexible building slabs only ½-in. in thickness, electrical transmission poles made by spinning in the mold, so flexible that they can be sprung 7 ft. from the vertical and return to place, and new groined arch roof construction that is light, strong and architecturally beautiful. And think of the possibilities of the French "ciment fondu" with nearly three times the tensile strength of the cement of the ordinary sort! Again we have realized how little real progress has been made into the realms of rock products chemistry.

Rebuilding Japanese Cities

It is interesting to note from news dispatches already received that American built skyscrapers (seven and eight stories) withstood both earthquake and fire better than any other kind of construction. This was also the case in San Francisco. In all probability in rebuilding Tokio and Yokohama this type of construction will largely predominate. This will mean great demands for rock products. Steel requires nearly as much limestone to produce as it does iron ore, while all the other ingredients of skyscrapers are the direct products of sand, gravel, stone, lime, gypsum and cement.

Japan has a considerable and prosperous portland cement industry. The newest plant was completed in 1919 and is located at Kawasaki, which may be in the earthquake zone. Probably the rebuilding of the ruined cities will create a demand for foreign-made cement, but existing conditions on our own west coast seem to preclude any possibility of this demand being met by American portland cement manufacturers. Gypsum, on the other hand, will probably be exported in large amounts, for apparently there are few gypsum deposits in Japan, and Alaskan gypsum has always been used there to some extent.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	.....
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Pennsylvania	1.35	1.35	1.45	1.35	1.35	1.35
Munns, N. Y.	1.00	1.40	1.40	1.30	1.30	.....
Prospect, N. Y.	.80	1.40	1.40	1.30	1.30	.....
Walford, Pa.	1.55	1.55	1.55	1.55	1.55	1.55
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.75	.....	1.50	1.35	.....	.....
Buffalo, Iowa	.90	.....	1.35	1.15	1.20	1.20
Bloomville, Middlepoint, Dunkirk, Bellevue, Ohio	1.00	1.10	1.10	1.00	1.00	1.00
Chasco, Ill.	1.35	1.35	1.35	1.35	1.35	1.00
Chicago, Ill.	.80	1.50	1.10	1.10	1.10	1.10
Dundas, Ont.	.90	1.35	1.35	1.25	1.10	1.10
Greencastle, Ind.	1.25	1.15	1.05	.95	.95	.95
Krause, Columbia and Valmeyer, Ill.	1.20	1.20	1.35	1.35	1.20	1.20
Lannon, Wis.	.80	1.10	1.10	1.00	1.00	.90
Mitchell, Ind.	1.00	1.00	1.00	1.00	1.00	1.00
Montreal, Canada	.90	1.20	1.10	1.00	.95	.95
Montrose, Iowa	.....	1.50	1.60	1.55	1.45	1.40
Sheboygan, Wis.	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10
Southern Illinois	1.35	1.35	1.35	1.35	1.35	1.00
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Ia.	.75	.....	1.50	1.40	1.30	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	1.00	1.00	1.00	1.00
			Prices include 90c freight			
Waukesha, Wis.	1.00	1.00	1.00	1.00	1.00	1.00
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	.....
Bridgeport, Texas	1.10	1.40	1.35	1.35	1.25	1.25
Bromide, Okla.	.75	2.00	1.75	1.60	1.50	1.25
Cartersville, Ga.	1.25	1.60	1.60	1.00	1.20	1.15
Chickamauga, Tenn.	.85@1.00	1.00@1.25	.85@1.25	.85@1.25	.85@1.25	.....
El Paso, Texas	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.40	1.75	1.75	1.60	1.40	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	.....	.....	1.40	1.40	1.40	.....
Morris Spur (near Ft. Worth), Tex.	1.10	1.35	1.30	1.25	1.25	1.20
WESTERN:						
Atchison, Kans.	.50	2.10	2.10	2.10	2.10	1.60‡@2.00
Blue Spr'gs and Wymore, Neb.	.20	1.40	1.40	1.35	1.25	1.20
Cape Girardeau, Mo.	1.35	.....	1.10	1.35	1.10	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.50	1.35	1.15	1.00	.....
Bound Brook, N. J.	1.70	2.10	1.80	1.50	1.40	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	1.00	2.25	2.00	1.50	1.40	.....
E. Summit, N. J.	1.80	2.30	1.90	1.60	1.40	.....
Eastern Massachusetts	.85	1.75	1.75	1.40	1.40	1.40
Eastern New York	.75	1.50	1.50	1.30	1.40	1.30
Eastern Pennsylvania	1.25	1.55	1.50	1.40	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.50@2.00	1.35@1.50	1.15@1.25	1.00@1.10	.....
Oakland, Calif.	1.75*	1.75*	1.75*	1.75*	1.75*	1.75*
Richmond, Calif.	.50*	.....	1.50*	1.50*	1.50*	.....
San Diego, Calif.	1.80	1.80	1.50@1.80	1.25@1.55	1.25@1.55	1.10@1.35
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	2.00	2.20	2.10	1.70	1.70	1.40
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Atlanta, Ga.—Granite	1.47	2.07	2.07	1.97	1.97	.....
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	.....
Columbia, S. C.—Granite	.50	2.25	2.25	2.00	2.00	2.00
Eastern Penna.—Sandstone	.85	1.60	1.55	1.35	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.75	1.75	1.75	1.25	1.25	.....
Middlebrook, Mo.—Granite	3.50@3.75	.....	2.00@2.25	2.00@2.25	.....	1.25@1.50
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

*Cubic yd. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

(Pulverized)

Chaumont, N. Y.—Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$—Thru 100 mesh; sacks, 4.00; bulk	2.50
Grove City, Pa.—Analysis, 94.80% $CaCO_3$, 1.50% $MgCO_3$; 60% thru 100 mesh; 45% thru 200 mesh; 100% thru 20 mesh; sacks, 5.00	3.50
Hillsville, Pa.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, 5.00; bulk	3.50
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk	2.50
New Castle, Pa.—96% $CaCO_3$ 1.40% $MgCO_3$—75% thru 100 mesh, 94% thru 50 mesh; sacks, 5.00; bulk	3.50
Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk	3.00
Watertown, N. Y.—Analysis, 96% **$CaCO_3$; .02% $MgCO_3$; 90%** thru 100 mesh; bulk, 3.00; sacks	4.50
West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.75—cloth, 5.25; bulk	3.25
Alton, Ill.—Analysis, 98% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 100 mesh	6.00
Belleville, Ont.—Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Chasco, Ill.—Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh..	5.00
90% thru 50 mesh	1.35
Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh	1.80@3.80
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 80-lb p. sacks 5.00; bulk	3.50
Piqua, Ohio—100% thru 10 mesh, 2.10; 50% thru 100 mesh, 2.25; 80% thru 100 mesh, 5.00; 100% thru 100 mesh; bags 7.00; bulk	5.50
Waukesha, Wis.—Analysis, neutralizing equivalent 107.38% $CaCO_3$; 99% thru 10 mesh, 55% thru 60 mesh; bulk	2.35
200-mesh bags ex., returnable	4.50
Hot Springs, N. C.—50% thru 100 mesh; sacks, 4.25; bulk	2.70
Knoxville, Tenn.—80% thru 100 mesh, bulk (bags 1.25 extra)	2.70
Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; bulk	2.75
Mountville, Va.—Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks	5.00
Colton Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk	4.00
Lemon Cove, Calif.—Analysis, 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk	4.50

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.1% $MgCO_3$; 90% thru 50 mesh	1.50
Bellevue, Ohio—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh	1.25
Bettendorf, Iowa, and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Buffalo, Iowa—90% thru 4 mesh	1.00
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 100% thru 10 mesh, 90% thru 50 mesh	1.50
90% thru 4 mesh, cu. yd.	1.35
Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$; 90% thru 4 mesh	.80
Columbia, Ill., near East St. Louis—½-in. down	1.25@1.80
Elmhurst, Ill.—Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$; 50% thru 50 mesh	1.25
Huntington and Bluffton, Ind.—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh	1.25

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Agricultural Limestone

(Continued from preceding page)

Greencastle, Indiana.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	2.00
Kansas City, Mo.—50% thru 100 mesh	1.50
Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh	1.20
Ladds, Ga.—Analysis, 61% $CaCO_3$, 35% $MgCO_3$—all passing 10 mesh	1.50@ 1.75
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 100% thru 4 mesh; 83% thru 10 mesh; bulk	1.25
Milltown, Indiana.—Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$; 35% thru 50 mesh	1.40@ 1.65
Mitchell, Ind.—Analysis, 97% $CaCO_3$, 1% $MgCO_3$; 50% thru 100 mesh, 90% thru 4 mesh	1.25
Montrose, Iowa.—90% thru 100 mesh	1.25
Narlo, Ohio.—Analysis, 56% $CaCO_3$ 43% $MgCO_3$; limestone screenings, 37% thru 100 mesh, 55% thru 50 mesh, 100% thru 4 mesh	1.50@ 2.00
Ohio (different points), 20% thru 100 mesh, bulk	1.25@ 1.50
Piqua, Ohio—100% thru 4 mesh	1.25
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ¼-in. mesh	1.30
Stone City, Iowa.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Toledo, Ohio.—¼ in. to dust, 30% thru 100 mesh	1.50
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75
Alderson, W. Va.—Analysis, 90⅓% $CaCO_3$; 90% thru 50 mesh	1.75
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh; 10% thru 10 mesh	1.50
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh	3.00
50% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Ladds, Ga.—50% thru 50 mesh	2.00
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCO_3$; 50% thru 50 mesh	.50
Kansas City, Mo., Corrigan Siding—50% thru 100 mesh; bulk	1.80
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

Glass Sand:	
Berkeley Springs, W. Va.	2.25@ 2.50
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.—24 mesh, 5.00; 40 mesh, 6.00; 100 mesh	7.00
Columbus, Ohio	1.50@ 2.00
Dunbar, Pa.—Damp	2.50
Falls Creek, Pa.	2.25
Hancock, Md.—Damp, 1.50; dry	2.00
Klondike and Pacific, Mo.	2.00@ 2.50
Mapleton, Pa.	2.25@ 2.50
Mapleton Depot, Pa.	2.50
Massillon, Ohio	3.00
Michigan City, Ind.	.50
Millville, N. J. (green)	2.00
Mineral Ridge, Ohio	2.50@ 3.00
Montoursville, Pa.	2.00
Oregon, Ill.	2.50
Ottawa, Ill.	1.50
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Rockwood, Mich.	2.50@ 2.75
Round Top, Md.	2.25
Sands, Pa.	2.50
San Francisco, Calif.	3.00@ 3.50
St. Louis, Mo.	2.50@ 3.00
St. Mary's, Pa.	2.25
Thayers, Pa.	2.25@ 2.50
Utica, Ill.	1.50
Zanesville, Ohio	2.00@ 2.50
Foundry Sand:	
Albany, N. Y.—Molding fine	2.25
Molding coarse	2.00
Sand blast (kiln dried)	4.50
Brass molding	2.25
Allentown, Pa.—Core and molding fine	1.75@ 2.00
Arenzville, Ill.—Molding fine	1.50@ 1.75
Brass molding	1.75
Beach City, Ohio.—Core, washed and screened	2.00@ 2.50
Furnace lining	2.50@ 3.00
Molding fine and coarse	2.25@ 2.50
Cheshire, Mass.—Furnace lining, molding fine and coarse	5.00
Sand blast	5.00@ 8.00
Stone sawing	6.00
Cleveland, Ohio.—Molding coarse	1.50@ 2.00
Brass molding	1.50@ 2.00
Molding fine	1.50@ 2.25
Core	1.25@ 1.50

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Wholesale Prices of Sand and Gravel

Prices given are per ton, f.o.b., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.75	.75	.75
Ambridge and So. Heights, Pa.	1.25	1.25	1.25	.85	.85	.85
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		.90		1.00	1.25	
Farmingdale, N. J.	.48	.48	.75		1.10	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75		1.35	1.25
Machias, N. Y.	.75	.75	.85	.85	.85	.85
Pittsburgh, Pa.	1.25	1.25	1.25	.85	.85	.85
Portland, Me.		.50	1.75		1.35	1.35
Washington, D. C. (Rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.40				.90
Barton, Wis.		.40@ .60		.50@ .70	.50@ .70	
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75	.75@1.00	.75@1.00	.75	.75@1.00	.75@1.00
Des Moines, Iowa	.50	.50	1.25	1.60	1.60	1.60
Dresden, Ohio	.70	.60	.60	Unwashed ballast, .50 ton	.90	
Earlestead (Flint), Mich.	.70					
Eau Claire, Wis.	.40@ .45	.40	.85@1.15			.85
Elkhart Lake, Wis.	.66	.66	.70	.70	.70	.70
Ft. Dodge, Iowa		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Hamilton, Ohio		1.00			1.00	
Hawarden, Iowa	.60	.50			1.60	
Hersey, Mich.		.50			.75	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.65	.60	1.70	1.75	1.65	1.65
Mankato, Minn.	.50	.50	1.25@1.35	1.25@1.35	1.25@1.35	1.25@1.35
Milwaukee, Wis.	1.11	1.11	1.36	1.36	1.36	1.36
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	.60	.60	1.20	1.20	1.20	1.20
Riton, Wis.		.40			.60	
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65	1.45		2.10
St. Louis, Mo., deliv. on job	2.05	2.20	2.35	2.15		
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	.75	.60	1.00	.90	.75	.75
Waukesha, Wis.	.50	.50	.80	.80	.80	.80
Winona, Minn.	.40	.40	1.25	1.25	1.10	1.10
			(.05 ton discount 10 days)			
SOUTHERN:						
Atlanta, Ga.	1.24	1.24	2.79	1.90	1.90	1.90
Birmingham, Ala.	1.29	1.29	2.79	1.79	1.64	1.54
Charleston, W. Va.	all sand 1.40		all gravel 1.50			
Estill Springs, Tenn.	1.35	1.35		1.00	.85	.65
Ft. Worth, Texas		1.50	1.50	1.50	1.50	1.50
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75@1.00	.75@1.00	1.20	1.20	1.20	1.20
Lake Weir, Fla.		.60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.00	1.00	1.80	1.80	1.80	1.80
N. Martinsville, W. Va.	1.00				1.20	.80
New Orleans, La.	.25	1.35				
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw river sand, car lots, .75 per ton; Missouri river, .85)					
Los Angeles, Calif.		.70	1.20	1.20	1.10	1.10
Pueblo, Colo.	1.10*	.90*			1.50*	
San Diego, Calif.†	.50@ .70	.80@1.00	1.30@1.60	1.35@1.65	1.10@1.40	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.25*	1.25*	1.50*	1.25*	1.25	1.25*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine sand, 1/10 in.	Sand, ¼ in.	Gravel, ½ in.	Gravel, 1 in.	Gravel, 1½ in.	Gravel, 2 in.
Atlanta, Ga.	.30@ .40	.30@ .40				
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, .80 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dresden, Ohio		.60				
Dudley, Ky. (crushed sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.	.70	.50			.60	.60
Estill Springs, Tenn.						.85
Fishers, N. Y.		.60			.55@ .60	
Grand Rapids, Mich.						.50
Hamilton, Ohio					.70	
Hartford, Conn.		1.00*				
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas						.55
Janesville, Wis.		.65			.65@ .75	
Mankato, Minn.			All sand and gravel .60 per ton			
Montezuma, Ind.			Road gravel .50 per ton			
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.	.25					
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.		About 60% gravel, 40% sand, 1.55				
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Winona, Minn.				.60		
York, Pa.		1.00@1.20	(crushed rock sand)			

* Cubic yard. B Bank. L Lake. || Ballast † Low prices, wholesale; high prices, retail.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.25@2.35	1.25@1.35	1.25@1.35	1.25@1.35	1.25@1.35	1.25@1.35	1.25@1.35
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.15	1.15
Eastern Penn. and Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Erie, Pa.	Crushed run slag, 4 in. and less, 1.25@1.35						
Emporium, Pa.			1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.	All sizes, 1.50, f.o.b. Chicago						
Detroit, Mich.	All sizes, 1.65, f.o.b. Detroit						
Ironton, O.	2.05	1.45	1.75	1.45	1.45	1.45	1.45
Jackson, O.		1.35		1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
Steubenville, Lowellville, Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton and Roanoke, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50‡	10.50‡	10.50‡	9.00		8.50	1.80
Buffalo, N. Y.				12.00				
Berkeley, R. I.			12.00					2.30
Cassadaga, N. Y.			Agricultural marl 7.00					
Lime Ridge, Pa.							5.00	
West Rutland, Vt.	13.50	12.00					11.00	3.20
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00				6.00	
York, Pa. (dealers' prices)		11.00	11.00	11.00			9.50	1.65
CENTRAL:								
Cold Springs, Ohio		11.00	10.50		9.00		10.00	
Delaware, Ohio	12.50	11.00	10.00	11.50	10.00		10.00	1.60
Gibsonburg, Ohio	12.50							
Huntington, Ind.		11.00	10.00		9.00		10.00	
Luckey, Ohio	12.50a	11.00	10.00a					
Marblehead, Ohio		11.00	10.00				10.00	1.60
Marion, Ohio		11.00	10.00				10.00	1.80†
Mitchell, Ind.				12.00	11.00		10.00	1.60
Sheboygan, Wis.							10.00	
Tiffin, Ohio					9.00	11.00		
White Rock, Ohio	12.50				9.00	11.00		
Woodville, O. (dlrs.' price)	12.50a	11.00a	10.00a				10.00	1.60
SOUTHERN:								
Erin, Tenn.							9.00	1.50
El Paso, Texas							9.00	1.50
Karo, Va.							7.00	1.50
Knoxville, Tenn.	12.50	11.00	11.00	11.00	9.00		9.00	1.50
Ocala and Zuber, Fla.	14.00	14.00		14.00				1.75
Sherwood, Tenn.	12.50	11.00	11.00	11.00			8.50	1.50
Staunton, Va.					4.50		8.50	1.35
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							12.50	
San Francisco, Calif.	22.00	22.00	15.00	22.00				2.40
Tehachapi, Calif.							13.00	2.15

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §paper sacks. (a) 50-lb. paper bags; terms, 30 days net, 25c per ton or 5c per barrel discount for cash in 10 days from date of invoice; (b) burlap bags; (c) 200-lb. barrels.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio.—Core	.50@	2.00
Sand blast	4.50@	5.50
Molding fine	2.75@	3.00
Brass molding		2.50
Furnace lining	1.50@	2.00
Sand blast	3.50@	5.00
Molding coarse	1.50@	2.00
Stone sawing	1.50@	3.50
Traction	.50@	.90
Delaware, N. J.—Molding fine		2.00
Molding coarse		1.90
Brass molding		2.15
Dunbar, Pa.—Traction, damp		2.50
Dundee, Ohio.—Glass, core, sand blast traction		2.50
Molding fine, brass molding (plus 75c for winter loading)		2.00
Molding coarse (plus 75c for winter loading)		1.75
Eau Claire, Wis.—Core	1.00@	1.25
Sand blast	3.25@	3.75
Falls Creek, Pa.—Molding, fine and coarse		1.75
Sand blast		2.00
Traction		1.75
Franklin, Pa.—Core		2.00
Furnace lining		2.50
Molding fine and coarse		2.00
Brass molding		2.00
Greenville, Ill.—Molding coarse	1.30@	1.60
Joliet, Ill.—No. 2 molding sand and loam for luting purposes; milled		.80
Bank run		.65
Kansas City, Mo.—Missouri river core		.80
Kasota, Minn.—Molding fine	1.60@	1.85
Molding coarse, stone sawing	1.45@	1.75
Klondike, Pacific, Gray Summit, Mo.—Molding fine and coarse, stone sawing, roofing sand		2.00
Mapleton Depot, Pa.—Brass molding		2.00
Molding fine		2.00
Roofing sand		2.50
Mapleton, Pa. — Glass, core, furnace lining, molding fine and coarse; damp, 2.00; dry		2.75
Massillon, Ohio — Molding fine and coarse, furnace lining		3.00
Traction, core		2.75
Michigan City, Ind.—Core, traction		.50
Mineral Ridge, Ohio.—Core, furnace lining, molding fine and coarse, roofing sand, sand blast, stone sawing, traction, brass molding (green)		2.25
Montoursville, Pa.—Core	1.25@	1.40
Traction	1.00@	1.25
New Lexington, Ohio—Molding fine		2.25
Molding coarse		2.00
Oregon, Ill.—Core	1.50@	2.00
Sand blast		4.00
Stone sawing	2.00@	2.50
Ottawa, Ill.—Core	1.50@	2.50
Furnace lining and traction		1.50
Roofing sand		1.50
Sand blast		4.50
Stone sawing		4.50
Brass molding		2.50
Molding, coarse (crude)	.85@	1.00

Miscellaneous Sands

(Continued)

Rockwood, Mich.—Core	1.90@	2.50
Roofing		2.75
Sand blast		3.75
Round Top, Md.—Core (damp)		1.60
Traction (damp)		1.75
Roofing sand		2.25
San Francisco, Calif. (washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@	3.50
(Direct from pit)		
Furnace lining, molding coarse, sand blast		3.60
Stone sawing, traction		2.30
St. Louis, Mo.—Red heavy molding	1.50@	2.25
Red fine	1.50@	2.00
Molding fine and brass	2.00@	3.00
Skein core	1.75@	2.25
White core sand	1.00@	1.75
Sand blast	2.00@	4.50
Furnace lining	1.50@	2.50
Roofing sand	1.00@	1.50
Stone sawing	1.25@	2.00
Thayers, Pa.—Core		2.00
Furnace lining, molding fine and coarse		1.25
Traction		2.00
Utica, Ill.—Core		.85
Molding fine, molding coarse	.85@	.90
Furnace lining, stone sawing		1.00
Warwick, Ohio.—Furnace lining, dry 1.75, green		2.00
Molding fine and coarse, dry 2.50; green		1.75
Traction and brass molding		2.50
Core, dry	2.50@	2.75
Core, green		1.75
Zanesville, Ohio.—Molding fine, brass molding	1.75@	2.00
Molding coarse	1.50@	1.75

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Asheville, N. C.—Best white and 200-mesh (per ton)		8.00
Yellow (per ton)		9.00
Red (per ton)		13.00
Baltimore, Md.—Crude talc (mine run)		3.50
Ground talc (20-50 mesh), bags		10.00
Ground talc (150-200 mesh), bags		12.00
Cubes		60.00
Blanks (per lb.)		.08
Chatsworth, Ga.—Crude talc		4.50
Ground talc (150-200 mesh); bags	8.00@	10.00
Chester, Vt.—Crude talc	3.50@	5.00
Ground talc (150-200 mesh), bags	7.00@	9.00
Emeryville, N. Y.—325 mesh (double air floated), bags		14.75
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags		18.00
Henry, Va. — Crude talc (lump mine run) per 2000-lb. ton	3.00@	3.50
(150-200 mesh), bags	10.00@	12.50
Keeler, Calif., bulk	17.00@	25.00
Los Angeles, Calif.—Crude	15.00@	22.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk, 5.00; bags		6.00
(150-200 mesh); bulk, 7.00; bags		8.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@	13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@	10.00
Ground talc (150-200 mesh), bulk	10.00@	22.00
Vermont—Ground talc (20-50 mesh); bags	7.50@	10.00
Ground talc (150-200 mesh); bags	8.50@	15.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk		5.00
(Bags 1.00 extra)		
Ground talc (150-200 mesh), bulk	8.00@	14.00
(Bags 1.00 extra)		
Pencils and steel workers' crayons, per gross	1.20@	2.00

Rock Phosphate

(Raw Rock)

Per 2240-lb. Ton

Centerville, Tenn.—B.P.L. 65%	6.00@	8.50
B.P.L. 65%		6.00
Gordonsburg, Tenn.—B.P.L. 68-72%	5.50@	6.50
Mt. Pleasant, Tenn.—Analysis, .65-70% B.P.L. (2000 lb.)		6.50
Paris, Idaho.—2000 lb. mine run, B.P.L. 75%	4.50@	5.00
Ottawa, Minn.—All crude silica sand	.75@	1.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

(Ground Rock)

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. ton	
Barton, Fla.—Analysis, 50-65% B.P.L.	3.50@ 8.00
Centerville, Tenn.—B.P.L., 65%	6.50*
Benotis, Fla.—Analysis 77-82% B.P.L.	8.00
Montpelier, Idaho. — Analysis, 72% B.P.L., crushed and dried	3.75
Mt. Pleasant, Tenn.—B.P.L. 65%	6.50
Twomey, Tenn.—B.P.L. 65%	6.50

*Less $1.00 per ton dealer commission.

Florida Soft Phosphate

(Raw Land Pebble)

	Per Ton
Benotis, Fla.—Analysis 26-28% phosphoric acid—200 lb. sacks, carload lots	10.00
Jacksonville (Fla.) District	10.00@12.00

(Ground Land Pebble)

	Per Ton
Jacksonville, Fla., District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65% B.P.L.	5.95

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	22.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	23.50

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	16.00@20.00
Slate granules		6.50@ 7.00
Granville, N. Y.—Red slate granules		7.50
Harrisonburg, Va.—Blk. marble (crushed, in bags)		12.50
Ingomar, Ohio (in bags)		8.00@25.00
Milwaukee, Wis.		14.00@26.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsburg, N. J.	16.00@20.00	14.50@18.00
Poultney, Vt.—Slate granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.— (2000 lb.)		8.00@12.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags 12½c extra	4.50	4.50

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	27.00@35.00
Carpenterville, N. J.	19.00	31.50
Easton, Pa.	16.00	40.00@60.00
Ensley, Ala.	16.00	26.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	22.00	32.00
Houston, Tex.		19.50
Omaha, Neb.	18.00	30.00@40.00
Portland, Ore. (Del'd)	21.00	30.00@60.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@37.50
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Springfield, Ill.	18.00	20.00@25.00
Wauwatosa, Wis.	15.00@16.00	28.00@75.00
Watertown, N. Y.	21.00@22.50	35.00@37.50
Winnipeg, Can.	18.00	26.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	11.00
Boston, Mass.	15.00@16.50
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	15.00
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Rives Junction, Mich.	12.00
Saginaw, Mich.	12.00
San Antonio, Texas	13.00
San Antonio, Texas (deliv. city lts.)	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	20.00
F.o.b. cars	15.00

Gray Clinker Brick

Washington, D. C.	14.50
El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	22.50	14.00
Baltimore, Md.	24.25	17.25
Cincinnati, Ohio	16.80	14.30
Chicago, Ill.	20.00	20.00
Dallas, Tex.	22.00	.....
Denver, Colo.	24.00	.....
Detroit, Mich.	21.00	20.00
Detroit, Mich.	21.00	20.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	21.00	21.00
New York, N. Y.	18.20	13.10
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	.....
Seattle, Wash. (paper sacks)	24.00	.....

Portland Cement

Prices per bbl. and per bag net in carload lots

	Per Bag	Per Bbl.
Atlanta, Ga.	.....	2.78
Boston, Mass.	.....	2.68@2.78
Buffalo, N. Y.	.....	2.53
Cedar Rapids, Iowa	.62	2.48
Cincinnati, Ohio	.63½	2.54
Cleveland, Ohio	.61½	2.46
Chicago, Ill.	.55	2.30
Columbus, Ohio	.....	2.49
Dallas, Texas	.56¼	2.25†
Davenport, Iowa	.60¾	2.43
Dayton, Ohio	.....	2.48
Denver, Colo.	.....	2.65
Detroit, Mich.	.62	2.48
Duluth, Minn.	.56¼	2.14
Indianapolis, Ind.	.60¼	2.41
Kansas City, Mo.	.61¼	2.45
Los Angeles, Cal. (less 5c dis.)	.....	2.86
Memphis, Tenn.	.....	2.84
Milwaukee, Wis.	.59¼	2.46
Minneapolis, Minn.	.62½	2.61
Montreal, Canada (sks. 20c ext.)	.....	2.40
New Orleans, La.	.....	2.83
New York, N. Y.	.....	2.40
Philadelphia, Pa.	.....	2.56
Phoenix, Ariz.	.....	3.30
Pittsburgh, Pa.	.56	2.24
Portland, Ore.	.....	3.05
San Francisco, Cal.	.....	2.63*
St. Louis, Mo.	.58¾	2.35
St. Paul, Minn.	.62½	2.61
Seattle, Wash. (10c bbl. dis.)	.....	2.90
Spokane, Wash.	.....	.....
Toledo, Ohio	.62	2.48

†Sack 10c ext.; 10c dis. 10 days.
*Warehouse, 3.15.
NOTE—Add 40c per bbl. for bags.

Mill prices f. o. b. in Carload Lots to Contractors

	Per Bag	Per Bbl.
Buffington, Ind.	.48¾	1.95
Cincinnati, Ohio	.....	3.00†
Concrete, Wash.	.....	2.60
Dallas, Texas	.....	2.15
Dayton, Ohio	.....	2.85†
El Paso, Tex.	.....	3.20*
Hannibal, Mo.	.....	2.10
Hudson, N. Y.	.....	2.20
Indianapolis, Ind.	.....	2.96†
Leeds, Ala.	.....	2.20
Los Angeles, Calif.	.....	2.80
Louisville, Ky.	.....	2.92†
Memphis, Tenn.	.....	3.24†
Northampton, Pa.	.....	2.10
Phoenix, Ariz.	.....	4.30‡
Steelton, Minn.	.51½	1.95
Universal, Pa.	.50	2.00

†Including cloth sacks.
*Gross, 10c sacks and 10c per bbl. disc 10 days.
‡Gross, 15c sacks and 5c per bbl. disc. 10 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	¼x32x36" Plaster Board Weight 1500 lb. Per M Sq. Ft.	⅜x32x36" Plaster Board Weight 1850 lb. Per M Sq. Ft.	⅜x32 or 48" Wallboard, Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	6.00	6.00	.....	13.00	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3 00	.....	5.00	10.00	10.00	10.00	.....	.....	31.00	.....	19.75	20.00	30.00
Hanover, Mont.	4 50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	11.00	11.50	.....	.....	33.75	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	16.40	.....	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Bags, 10c each; Paper Bags, $1.50 per ton extra (not returnable).
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding $0c per ton

Traffic and Transportation

By EDWIN BROOKER, Consulting Transportation and Traffic Expert,
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning September 2:

Central Freight Association

7005. Crushed Stone and Screenings, from West Winfield, Pa., to Chester, W. Va. Present, 16½ cents; proposed, $1.75 per net ton.

7706. Ashes, Cinders (except mill cinder and pyrites ore cinder) and Slag in bulk, minimum weight 90 per cent of marked capacity of car, except when car is loaded to full cubical or visible capacity actual weight will apply, from Sharpsville, Pa., to Grove City, Pa. Present, $1.05 per net ton; proposed, 90 cents per net ton.

7004. Crushed Stone, from Mitchell, Ind., to Nisbet, Ind. Present, $1.37; proposed, $1.10 per net ton.

7010. Lime, from Petoskey, Mich., to Kegomic, Mich. Present, 10½ cents; proposed, 6 cents.

7012. Sand and Gravel, from Lafayette, Ind., to La Porte, Ind. Present, 15 cents; proposed, 95 cents per net ton.

7015. Gypsum Rock, run of mine; Gypsum Rock, Crushed (not ground), from Michigan and Ohio to Fultonham, Ohio.

From Grand Rapids, Mich., Eagle Mills, Mich., Wentworth, Mich.

To	(In cents per 2000 lb.) Present	Proposed
Fultonham, Ohio	$4.20	$3.15
From Gypsum, Ohio, Port Clinton, Ohio.		
To		
Fultonham, Ohio	2.60	2.10

7025. Stone, crushed, coated with oil, tar or asphaltum, sometimes known by the trade names of "amesite" or "carbo-rock," Toledo, Ohio, to C. F. A. Territory. Proposed, 15 cents per net ton over the interstate crushed stone mileage scale.

7027. Crushed Stone, Lima, Ohio, to Bimo, Mich. Present, 78 cents per net ton; proposed, 60 cents per net ton.

7030. Sand and Gravel, from Evansville, Ind., Henderson, Ky., Mt. Vernon, Ind., and Maunie, Ill., to Illinois and Indiana. Present and proposed, as per Exhibit A attached. Proposed description and carload minimum weight. "Sand and gravel, C. L. minimum weight 90 per cent of marked capacity of car except that when cars are loaded to full cubical or visible capacity actual weight will apply, but not less than 40,000 lb."

	From Evansville, Ind.		From Henderson Ky.	
	In cents per net ton			
To	Pres.	Pro.	Pres.	Pro.
Balknap, Ind.	$ .76	$ .70	$1.16	$1.10
Mt. Vernon, Ind.	.81	.81	1.21	1.21
Epworth, Ill.	.88	.85	1.28	1.25
Carmi, Ill.	.85	.85	1.25	1.25
McLeansboro, Ill.	1.01	1.04	1.41	1.44
Mt. Vernon, Ill.	1.27	1.27	1.67	1.67
Nashville, Ill.	1.50	1.50	1.90	1.90
Eldorado, Ill.	1.04	1.04	1.44	1.44
Shawneetown, Ill.	1.50	1.50	.....	1.90
O'Fallon, Ill.	1.73	1.73	2.13	2.13

	From Mt. Vernon, Ind.		From Maunie, Ill.	
	In cents per net ton			
To	Pres.	Pro.	Pres.	Pro.
Balknap, Ind.	$	$	$	$ .....
Mt. Vernon, Ind.	.....	.....	.88	.90
Epworth, Ill.	.88	.85	.63	.70
Carmi, Ill.	.85	.85	.75	.70
McLeansboro, Ill.	1.01	1.04	1.01	1.00
Mt. Vernon, Ill.	1.27	1.27	1.13	1.20
Nashville, Ill.	1.50	1.50	1.26	1.30
Eldorado, Ill.	1.04	1.04	1.01	1.20
Shawneetown, Ill.	1.38	1.38	1.26	1.30
O'Fallon, Ill.	1.61	1.61	1.51	1.50

7037. Slag, Sharpsville, Pa., to Hydetown, Pa. Present, 15 cents; proposed, $1.25 per net ton.

7043. Crushed Stone, from France Quarries, Ohio, to Lima, Leman, Cridersville, Wapakoneta, Botkins, Anna Swanders, Sidney, Kirkwood, Piqua Junction, Piqua, Farrington, Eldean, Troy, Tippecanoe City, Taylorsville and Dayton, Ohio. Present, sixth class; proposed, 90 cents per net ton.

Illinois Freight Association

377H. Lime, C. L., minimum weight 30,000 lb. (a) 17½ cents per 100 lb. from Glencoe, Mo., to points intermediate to Milwaukee, Wis., on C. M. & St. P. & S. S. M. north of line of E. J. & E. Ry., and (b) to establish to the same points of destination rates currently applicable to Milwaukee, Wis., from Mitchell and Milltown, Ind., Hannibal, Louisiana, Glencoe, Glen Park, Kincke, Byers, Ste. Genevieve, Mosher, Centaur and Eugene, Mo., and Alton, Ill. (87-1-37.)

593C. Sand and Gravel, C. L., minimum weight 90 per cent of marked capacity of car, 75 cents per net ton from Cowling, Ill., to Carmi, Ill. (387-1-86) (M. R. P. 229).

1452B. Gravel, Novaculite, C. L., minimum weight capacity of car, $1.51 per net ton from Elco and Gravel Pit, Ill., to Georgetown, Ill. (387-4-69) (M. R. P. 237).

2020. Molding Sand, C. L., minimum weight 90 per cent of marked capacity of car, 80 cents from Tamalca, Ill., and 88 cents from Arenzville, Ill., to Litchfield, Ill.

2044. Lime, C. L., minimum weight 60,000 lb., 10 cents per 100 lb., from Hannibal, Mo., Marblehead and Quincy, Ill., to Decatur, Ill., and 10½ cents per 100 lb. to Edwardsville, Ill. (M. R. P. 232).

2046. Sand and Gravel, C. L., minimum weight 90 per cent of marked capacity of car, $1 per net ton from Metropolis, Ill., to Shattuck, Ill.

2049. Lime, C. L., minimum weight 30,000 lb., 14 cents per 100 lb., from Quincy, Marblehead, Ill., Hannibal, Mo., and group points to Des Plaines, Edison Park, Norwood Park, Park Ridge, Rosehill, Ravenswood, Rogers Park and Summerdale, Ill.

1190C. Crushed Stone, Rip Rap, Rubble, Ground Ganister, Ground Limestone Chatts and Stone Quarry Strippings, carloads, to amend Item 200, C. M. & St. P. G. F. D. 4300 F, publishing rates between Libertyville, Grays Lake, Fox Lake, Ill., Milwaukee, Wis., Franklin Park, Fulton, Ill., Watertown, Wis., Rochells, Oglesby and Rockford, Ill., and group points on the one hand and St. Louis, Mo., and group points on the other hand to provide for minimum weight, as follows: Ninety per cent of marked capacity of car, except when car is loaded to full cubical or visible capacity, actual weight will apply, but not less than 40,000 lb. (See note.)

Note—For marked capacity of cars see current issue of Agent Conrad's Equipment Register (387-19-1) (M. R. P. 241).

2059. Sand and Gravel, carloads, minimum weight 90 per cent of marked capacity of car, e. g.:

To	From Evansville, Ind.	From Henderson, Ky.
Mt. Vernon, Ill.	$1.27	$1.67
Belleville, Ill.	1.61	2.01
St. Louis, Mo.	1.61	2.01
O'Fallon, Ill.	1.73	2.13

To	From Mt. Vernon, Ind.	From Maunie, Ill.
Mt. Vernon, Ill.	$1.27	$1.20
Belleville, Ill.	1.61	1.50
St. Louis, Mo.	1.61	1.50
O'Fallon, Ill.	1.61	1.50

2064. Sand and Gravel, C. L., minimum weight 90 per cent of marked capacity of car, $1.01 per net ton from Grayville, Ill., to Paris, Oliver, Marshall, Arnold's Switch, Snyder, Walnut Prairie, West Union, Rock Hill Switch, West York, Coal Dock Switch and Hutsonville, 88 cents to Trimble, Robinson, Suncanville, Flat Rock, Birds, Pinkstaff, Lawrenceville, Billet, St. Francisville and Allendale, and 76 cents to Patton, Mt. Carmel and Schrodts, Ill.

New England Freight Association

5120. Crushed Stone (trap rock), Westfield, Mass., to Stuyvesant, N. Y., $1.40 per net ton. Reason: To establish rate comparable to existing rates for similar service.

5121. Sand or Gravel, common, North Wilbraham, Mass., to Stuyvesant, N. Y. 7. Reason: To establish rate comparable to existing rates for similar service.

5146. Lime, West Rutland, Vt., to New York, inclusive, lighterage 17, Brooklyn, stations 17, Long Island R. R. stations 21½, 22¼, 25¼ cents. Reason: To provide rates on proper basis.

Southern Freight Association

10915. Sand and Gravel, C. L., from Golden, Miss., to Birmingham, Ala. Present rate, 6½ cents per 100 lb.; proposed rate, 79 cents per net ton, made in line with rates from and to other Southern points, distance considered.

10916. Slag, C. L., from Birmingham, Ala., and points taking same rates, to Grenada, Miss. Present rate, $2.25; proposed rate, $1.71 per net ton, same as the proposed Georgia scale (single line), less 10 per cent, for 302 miles; also in line with rates from Birmingham to other Southern points, distance considered.

10919. Slag, C. L., from Birmingham, Ala., and Group to Tallahassee, Fla. Present rate, $2.59 per net ton; proposed rate, $2.03 per net ton, same as present rate to Jacksonville, Fla.

10950. Sand, C. L., from Norfolk Southern R. R., Electric Division, stations to Greenville, Farmville and Wilson, N. C. It is proposed to reduce present rates to be the same as in effect from Norfolk, Va.

10952. Cement, C. L., from Nashville, Tenn., to Southeastern common and junction points and N. C. & St. L. Ry. local stations. In lieu of present sixth class rates, it is proposed to establish the following rates: To Chattanooga, Tenn., 11 cents; Knoxville, Tenn., Attalla, Godsden, Ala., and Dalton, Ga., 15 cents; Huntsville, Ala., 11½ cents; Atlanta, Ga., 17 cents; Rome, Ga., 16 cents, and Augusta, Ga., 20 cents per 100 lb. Poposed rates are made in line with present rates from Kosmosdale, Ky., Richard City, Tenn., and other cement producing points. Rates to intermediate N. C. & St. L. Ry. local stations to be established in line with above rates. To Lebanon, Tenn., and intermediate local stations on the N. C. & St. L. Ry. Lebanon Branch, the present rates range from 7 to 10½ cents per 100 lb. Proposed rates range from 4 to 9 cents per 100 lb., made in line with rates it is proposed to establish from Nashville, Tenn., to T. C. Ry. stations.

10963. Cement, C. L., from Birmingham and North Birmingham, Ala., to Garysburg, N. C. Present rate, 28½ cents; proposed rate, 26 cents per 100 lb., same as in effect from Leeds, Ala., to Garysburg.

10968. Slag, C. L., from Birmingham, Ala., and points taking same rates to Grenada, Miss. Present rate, $2.25; proposed rate, $1.71 per net ton, based on the proposed Georgia scale (single line), less 10 per cent, and is also in line with rates to other points in the same general territory, distance considered.

10971. Cement, C. L., from Hagerstown, Md., to Danville & Western Ry. stations. No through rates are today published from Hagerstown, but rates from Security, Md., a point located within the switching limits of Hagerstown, are published in Agent Cottrell's I. C. C. 316. It is proposed to publish the following rates from Hagerstown, Md.: To stations east of Fieldale, except points in North Carolina, $4.60 per net ton, made 1 cent higher than to Danville, Va.; to points west of Fieldale, Va., $4.80 per net ton, made 2 cents higher than to Danville, Va.

10974. Sand, C. L., from Williams, Ga., to Tallahassee, Fla. Present rates, $1.50 per net ton (Capitola combination); proposed rate, $1.17 per net ton, based on the joint line scale, less 10 per cent, submitted by carriers to the Alabama and Georgia Public Service Commission for application in those states.

10975. Sand, C. L., from Lipe, Tenn., to Florence, Sheffield and Tuscumbia, Ala. Present rate, 20½ cents per 100 lb. (Class N). Proposed rates: To Florence, $1.67; Sheffield and Tuscumbia, $1.75 per net ton. Proposed rates based on the proposed Alabama-Georgia scale, less 10 per cent.

10986. Lime, C. L., minimum weight 30,000 lb., from Ladds, Ga., to stations on the S. A. L. Ry. in North and South Carolina and to stations on the Georgia R. R., N. C. & St. L. Ry. and L. & N. R. R. in Georgia. It is proposed to revise present rates to be on basis of the mileage scale submitted by carriers to the Georgia Public Service Commission, less 10 per cent. The proposed rates to Georgia points to apply on intrastate traffic only.

11020. Crushed Marble, C. L., from Harrisonburg, Va., to Whitestone, Ga. Present rate, 55 cents per 100 lb. (Class "A"). Proposed rate, $3.81 per net ton, based on Atlanta, Ga., combination, using So. Ry. mileage scale rate of $2.61 to Atlanta, plus arbitrary of $1.20 per ton beyond.

11030. Cement, C. L., from Spocari, Ala., to Georgia points named below. Present and proposed rates are, in cents per 100 lb.:

(Continued on page 77)

New Machinery and Equipment

Track Shifting Car

IN these days when common labor is so scarce and high priced, every device for saving labor or making it more efficient is certain to be received with warm approval. The Track Shifting Car, illustrated, is such a device, and it will be welcomed by the operators of quarries and gravel pits, who have an especially large amount of track shifting to do as part of the regular operation.

The machine will raise a track vertically or shift it sidewise. The body is a four-wheeled car 10x7 ft. in size. In the center is a vertical spud which may be raised and lowered by a rack and pinion. This spud is fitted with a broad shoe which rests upon the ground. The pinion mechanism has a lateral travel across the floor of the car. In operation, four rail tongs, which are attached to the car, are clamped to the rails. By working the rack and pinion, the track may be lifted and by means of the side travel it may be moved sidewise as desired.

The car may be used for shifting tracks on dumps as well as those on solid ground. In fact, the car was developed from a machine which was used for some months in shifting tracks on the ore dump of a Minnesota iron mine.

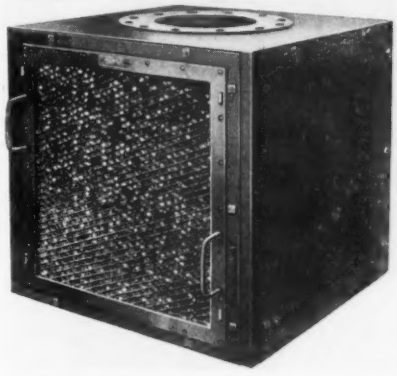
The machine is made by the Lake Superior Loader Co. of Duluth, Minn.

Midwest Air Filters

THESE filters employ no sprays and do not use electrostatic force to settle the dust. They work on the principle of employing a structure which serves both as a screen and a baffle, which catches the dust and allows the air to pass. The surfaces over which the air passes are made sticky by a special preparation known as Midwest Viscosine, which does not evaporate or dry out. Particles of dust are caught and held by the Viscosine until the innumerable small air passages are spanned over by fine screens of viscose-moist dust, by which the efficiency of the filter is materially increased.

Midwest filters show practically constant resistance to the flow of air under increasing dirtiness and require very infrequent cleaning. They will catch any drops of water and oil carried in the air currents; they are of simple, substantial and fireproof construction and they have no moving parts to get out of order.

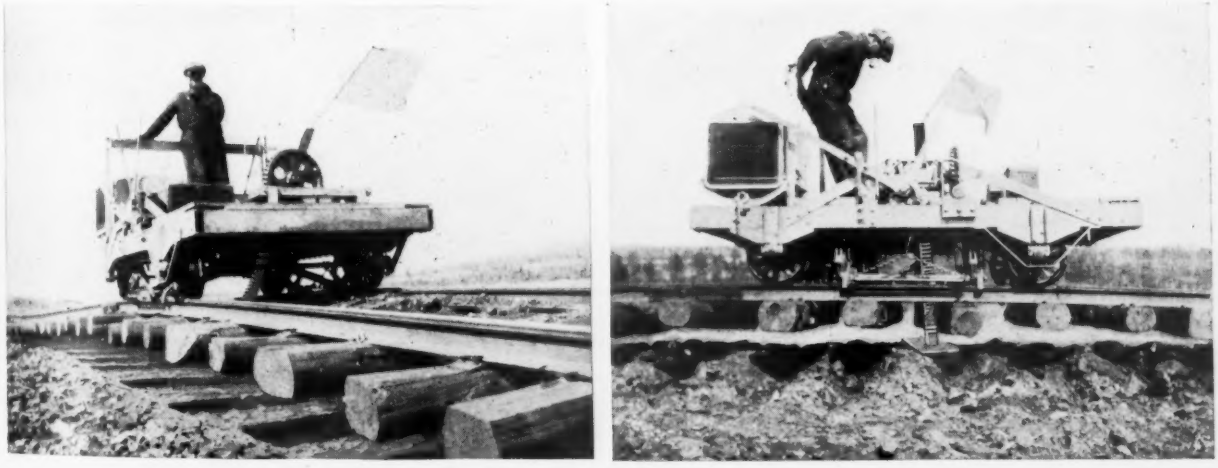
They have many applications in the industries in which the readers of ROCK PRODUCTS are interested. Some of these are the protection of pneumatically operated tools, internal combustion engines and air compressors. The filtration of the air before it is used in any of these adds much to the life of the machine besides insuring more satisfactory work.



Type B Midwest box filter, adapted to ordinary uses

Type F filter with special arrangements for withdrawing cells

Midwest filters are made in several forms, to fit the amount of work they have to do and the pressure of the air which passed through them. The Type B box filter is a form adapted to ordinary uses and pressures. It is especially adapted to the protection of internal combustion engines. The Type F compressor filter is a more expensive machine designed for the filtering of air before it is compressed. It is a more complicated machine with special arrangements for drawing out the filter cells for cleaning and recharging. In addition to these the company makes a high pressure filter adapted to filtering air which has been compressed.



Lake Superior Loader Co.'s track shifting car, showing mechanism and also the car in position and lifting the track clear of the ground

Besides these filters the Midwest company makes steel sections for use in reinforced concrete and brick buildings. Midwest box rails permit boxing for shafting to be rigidly placed in such buildings, insuring alignment and the proper spacing of boxes. The anchorage rails and stirrups and socket insets are important for giving solid construction and providing anchorage for future equipment.

Trade names are given to these products: Ankerails, which are embedded in the concrete at the time of construction; socket inserts for anchoring light equipment; steel stringers, which may be used in either old or new buildings, and accessories used in connection with the above.

The offices of the company are at 28 West 44th street, New York.

A Scale for Rock Products Plants

A SCALE, especially designed for use in industries where finely ground material is packed in predetermined weight packages, made up in containers of uniform weight, has recently been put on the market by the Toledo Scale Co., Toledo, Ohio.

The Toledo Automatic Net Weight Scale, as illustrated, was first introduced into flour mills, but is as well suited for rock products plants making up packages of any predetermined weight.

The possibility of an error in reading this scale is reduced to the minimum, as there is only a single indication on the small chart and no figures are read.

The scale is especially designed for use in dusty locations and all head joints have been machined and fitted with tight-fitting gaskets to keep the dust out of the mechanism.

Toledo net weight automatic scale

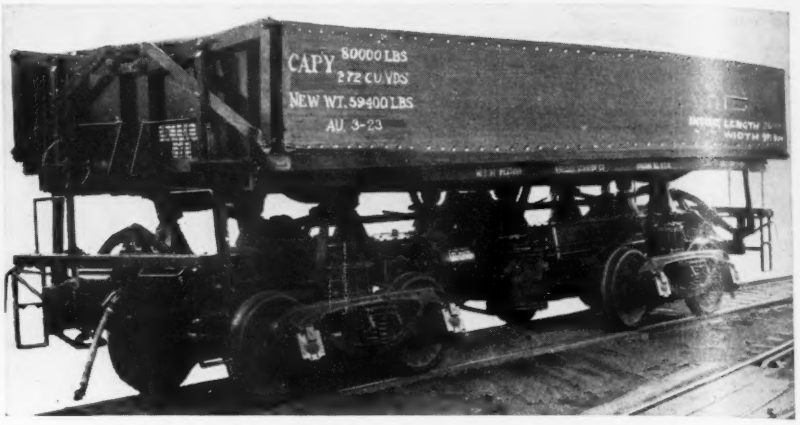
The weighing platforms are the cast gratings as shown, the upper one for small packages being adjustable as to height. It can also be swung around out of the way when the larger platform is being used. The flat platform, which in other types is the weighing platform, is entirely "dead" in this scale and accumulations of dust, etc., on it do not affect the weights. The loads on the grating platforms are carried through to the lever mechanism on steel studs coming up through the dead platform at the four corners. These gratings can be simply lifted off these studs to facilitate cleaning around the scale.

An empty bag or container to be used and test weights, equal to the net amount of the commodity desired, are placed on one of the platforms. The poises are moved along the beams until the indicator is brought nearly to zero and are then locked. The test weights and container are then removed and the scale is then ready for making up packages with a net weight equal to total weight value of the test weights used. This "setting up" operation is repeated whenever a run is completed and a different weight package is desired.

This results in full compliance with the Federal Net Weight Package Act, as the above operations automatically take care of the tare weights of the empty containers.

The scale is adaptable for use in making up packages up to 250 lb., total weight. It can be furnished in either the portable or dormant types, depending upon which model is best suited to the particular conditions to be satisfied.

The simple operation, simple construction and the other features noted, which make correct weight easy of attainment with this scale, should make it particularly attractive to lime and pulverized limestone plants.



This car will stand up under loading with 10-yd. shovel

Quarry Cars That May Be Loaded with 10-Yard Dipper

TO furnish dump cars that would stand up under loading with rock by a 10-yd. dipper was the problem put up to the Western Wheeled Scraper Co. by the manager of one of the largest quarries in the country, located in northern Michigan, and it is not just an occasional loading that these cars get, for they make a round trip from the shovel to the crusher every 50 min. for 20 hr. each day from April to December.

The cars furnished were similar to the standard 25-cu. yd. Western automatic air dump cars that have been used extensively in the copper mining industry for several years. The width of the bed was increased to give a level full capacity of 27.2 cu. yd., and the floor and doors were of unusual heavy construction to withstand the terrific pounding they receive.

A special design of side frame for the cast steel trucks was used, which gives a clearance of 10 in. above the top of the rails, a very desirable feature in cars for quarry work.

The average load carried by the cars is approximately 50 tons, and they are operated in trains of 10 cars each between the shovel and crusher, a distance of 1½ miles. Fast operating schedules are possible owing to the excellent condition in which the tracks are maintained.

The contents of the cars are dumped directly into the crusher as rapidly as the cars can be spotted. They are dumped and righted by air furnished by the locomotive, and as they unlock and lock automatically the dumping of the entire load of 500 tons of stone requires but a few moments.

Their performance has been such that the cars can rightly be considered a most satisfactory link between the largest shovel and the largest crusher in the country.

News of All the Industry

Incorporations

The Hillside Quarries Co. has been incorporated for $50,000 at Dover, Del., by W. I. N. Lofland.

The Southern California Silica and Spar Co. of Los Angeles has been incorporated for $75,000.

The Seattle Sand and Gravel Co. of Seattle. Capital stock $50,000. Incorporators, M. Ross Downs, Richard Ward and David J. Grant.

The Greenlee Stone Co. has been incorporated in Denver, Colo., with a capital of $150,000 by Wm. T. Greenlee, 1245 Seventh street, John H. Harkins and Fleta M. Harkins.

The Iowa Concrete Brick Co. has been incorporated in Muscatine, Iowa, with a capital stock of $100,000, to manufacture tile, brick, piling and blocks, by J. E. Kranz of Muscatine and Frank M. Lytel of Washington.

The Palmetto Quarries Co. has been incorporated in Columbia, S. C., with a capital stock of $100,000. Thos. W. Waters is president and Geo. D. Loss is secretary and treasurer.

The Nelson Lime and Cement Co. has been incorporated in Memphis, Tenn., with a capital of $15,000 by W. A. Nelson, Jr., W. B. Patterson and G. A. Lambert.

The Detroit Cinder Block and Tile Co. has been incorporated in Detroit, Mich., with a capital of $250,500, with headquarters at 1830 Penobscot building.

The Polaris Concrete Products Co. has been incorporated in Duluth, Minn., with a capital of $150,000 to make concrete pipe, posts, battery wells, etc., by E. H. Dresser, 1405 London road, and others.

The Tripoli Marble Co. has been incorporated in Knoxville, Tenn., with a capital of $150,000 by Oscar J. Hawley, Wm. H. Dickinson and Rowland Hall.

The Washington Gunite Co., Seattle, Wash.; $10,000; W. C. Morse, R. G. Case and L. Pearl Morse incorporators.

The Gonzales Cement Works, Ins., of Gonzales, Texas; capital stock, $40,000; incorporators, A. O. Neuman, R. A. Remschel, J. F. Remschel.

The Henrico Sand and Gravel Corp., Richmond, Va., with a maximum capital stock of $100,000 preferred stock and 15,000 shares common stock, par value of preferred $10 per share and minimum capital stock $5000, has been granted a charter. The incorporators are E. S. Blanton, president; W. B. Kurtz and R. L. Roberts, all of Newport News, Va. The company will do a general sand and gravel business.

The Lum Point Moulding Sand Co., of Wilmington, Del., has been incorporated for $500,000.

Sand and Gravel

A plant to handle 1000 yd. of gravel in 8 hr. has been built at Lonview, Wash., by the Long-Bell Lumber Co., which is building the town.

Cris Oberlander of Moline, Ill., has established a sand shipping business at Colona, Ill. Several loading stands have been built near the Colona depot on the C. R. I. & P. railroad. This sand is used for building purposes. This enterprise gives employment to more than 50 men.

The Fort Worth Sand and Gravel Co.'s plant at Fort Worth, Texas, was recently damaged by fire to the extent of $850. A gasoline tank exploded and started the fire.

The Cajon Rock and Gravel Co. has opened offices at 523 Higgins building, Los Angeles, Calif. Frank Hudson, 323 23rd street, Santa Monica, Calif., is proprietor.

State Geologist Wilbur A. Nelson of Tennessee was in Carroll county recently visiting various sand deposits which it is believed will prove to be a fine grade of molding sand. Thirty samples of the sand each weighing 5 lb. has been sent to the Bureau of Standards at Washington for analysis.

The Rock, Gravel and Sand Co. is soon to move its plant from Niles, Calif., to Eliot, where the company has holdings from which they have been shiping from 25 to 50 cars daily. The company is shipping about 100 cars daily from Niles and expects to ship about 150 cars from its new plant at Eliot.

The Dixie Sand Co. has recently added about $50,000 worth of improvements to its plant at Chattanooga, Tenn.

The C. W. Roberts Sand and Gravel Co. plant at Eagle Ford, near Dallas, Tex., has opened a downtown yard in Dallas at the corner of Ross avenue and Orange street.

Rock Asphalt

The Natural Rock Asphalt Co., which has had its home office in Greenville, Ky., since its organization nearly two years ago, recently decided to move the main offices to Owensboro, the home of the recently elected president, Carlisle Kirkpatrick. Mr. Kirkpatrick was elected president of the company at the annual meeting of stockholders recently, succeeding P. W. Grinstead of this city. Mr. Grinstead was elected vice-president, succeeding J. W. Lessenberry, who is no longer connected with the company. R. R. Kirkpatrick is secretary and treasurer. The stockholders are mostly Greenville people or were formerly. The Natural Rock Asphalt Co. has paid up capital stock of $350,000 and additional stock of 5000 shares of no par value. The company employs 120 men at the mines and runs a barge from the mines, on the Upper Green, to Rockport, Ky., where the Illinois Central Railroad crosses the Green. Here it is loaded in cars for transshipment to all railroad points. An investment of $600,000 has already been made by the company.

Quarries

The Veronica (Calif.) Quarries are busy with orders for Santa Barbara roads.

The Italian Marble Products Co. of Chewelah (Wash.) has begun the production of marble chips. The new plant will be able to turn out 15 tons per day.

The Lueders Building Stone Co. has just opened a large quarry at Lueders, Texas. Fort Worth capital is interested.

The Republic Mining-Manufacturing Co. of Georgia has leased 500 acres near Abbeville, Ala., and will develop beauxite deposits.

The Climax Lime and Stone Co. plant has been purchased by T. E. Smith, a real estate dealer of Pittsburgh, Pa. The plant is located at Wick Station, Pa., on the Bessemer & Lake Erie R. R. It was operated successfully by the company with Raymond Smith as manager until last spring when it was found that it could not be operated profitably on account of the high price and scarcity of labor. Conditions are better now and the plant will again be placed in operation.

O. G. Stam and sons and Carl Swanson of St. Paul, Minn., have formed an organization and leased a 40-acre tract of land north of Belview, Minn., upon which they will open a granite quarry. The granite will be shipped in the rough to St. Paul and St. Cloud users. Tests made of the granite in the vicinity of Belview show that it is equal in every way to the Eastern granites and the supply is said to be unlimited.

The National Crushed Stone Co. will rebuild its plant in Sioux Falls, S. D., which was recently damaged by fire to the extent of $35,000.

Trade Literature

"Complete Engineering and Manufacturing Service"—The United Iron Works, Inc., Ridge Arcade Bldg., Kansas City, Mo., have published a complete set of catalogs and bulletins depicting the various equipment manufactured by them entering into the rock products and kindred fields. The United Iron Works, Inc., operates eight plants and is thus able to render complete service—from design and engineering to the final erection of the plant. This should insure a successful operation because of the concentrated responsibility. The company manufactures jaw crushers, crushing rolls, hoists, screens, elevators, pumps, quarry cars, steel plate work, cement mill equipment, brick machinery, track equipment, special foundry work, etc. Copies of any of the bulletins may be had by addressing the United Iron Works at the above address.

Cement

The Beaver Portland Cement Co., at Marble Mountain, Ore., will soon begin getting out the rock for the plant at Gold Hill. The officials of the company state that they expect to start their crusher on Friday, which will mark the completion of the project. The Friday run will be for a test and if this proves successful, the plant will immediately start up in earnest. Six cars of rock will go to the Gold Hill plant every day, the plant now being shut down for repairs. The limestone in the Gold Hill quarry ran out several weeks ago and the plant has been idle since that time. It was necessary to construct a railroad four miles long to reach the Marble mountain deposit.—Grants Pass Courier.

The Olympic Portland Cement Co., of Bellingham, Wash., will ship 550 barrels of cement to Honolulu via the steamship Lurline, due at the Bloedel Donovan mill next Saturday. The company is operating its plant day and night and is shipping heavily to Washington points.

The Sandusky Portland Cement Co. has about completed its new 110,000 bbl. warehouse near its plant at Bay Bridge, Ohio. The structure has six concrete tanks 85 ft. high.

Harry Marks, chairman of the Industrial Committee, Joplin, Mo., is interested in establishing a plant there for the manufacture of cement.

Jas. O. Parker, 313 Independent Life building, Nashville, Tenn., has been selected as president of the recently incorporated Southland Portland Cement Co. and will have charge of letting of contracts. Oscar Mather, Chattanooga, is treasurer and Ben L. Ireland, Nashville, is secretary.

Kansas concrete roads now total 429.35 miles, scattered through the various counties of the state.

Gypsum

Clyde B. Aitchison, interstate commerce commissioner, will hear Seattle and Tacoma manufacturers of gypsum and plaster who are seeking a suspension of westbound rates on these commodities granted recently to Montana manufacturers. Under the rate granted it is claimed gypsum and plaster from Hanover and Gypsum, Mont., can be shipped into Pacific Coast competitive territory at rates cheaper than the eastbound rates to the Montana rival territory on these commodities that now prevail as applied to coast manufacturers. The case is one of several pending before the commission in which Seattle and Puget Sound ports are interested.

The Empire Gypsum Co., Cutler building, Rochester, N. Y., has tentative plans for rebuilding the portion of its plant at Garbutt, N. Y., destroyed by fire July 21, with loss estimated at $25,000, including equipment. The power house also was damaged.

About 6,000,000 tons of marketable material are said to have been developed on the property of the Parkford Gypsum Co., 16 miles west of Parker, in Riverside county, Ariz. Three prospect tunnels have been driven into the deposit, which is reported one of remarkable approach to purity. Plans have been made for a seven-mile branch railroad from the Santa Fe station at Vidal.

The Gyp Valley Plaster Co. has been formed in Woods county, Okla., to develop a gypsum deposit in the county. The capital is being subscribed locally. James I. Monnett is president and Dwight C. Spray secretary of the company.

Obituary

C. H. Green, age 41, president of the Standard Asphalt Paving company and the Union Sand and Gravel company, of Spokane Wash., N517 Lincoln street, died at San Francisco Tuesday night, according to word received here by friends yesterday.

He had been under treatment there for some months for acute Bright's disease. His brother, Howard S. Green, associated with him in the contracting business, left last night for San Francisco. He is survived by his widow and two sons.

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

Air Compressors
Pennsylvania Pump & Compressor Co., Easton, Pa.
Worthington Pump & Mchy. Corp., New York City

Air Separators
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mchy. Co., Kingston, N. Y.

Automatic Weighers
Richardson Scale Co., Passaic, N. J.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Babbitt Metal
Ajax Metal Co., Philadelphia, Pa.
Lewistown Fdy. & Machine Co., Lewistown, Pa.

Bags and Bagging Machinery
Jaite Co., Jaite, Ohio

Balls (Tube Mill, etc.)
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Worthington Pump & Mchy. Corp., New York City

Belt Fasteners and Hooks
Crescent Belt Fastener Co., New York City

Belt Lacing and Rivets
Crescent Belt Fastener Co., New York City

Belting (Steel Conveyor)
Sandvik Steel, Inc., New York, N. Y.

Bins and Bin Gates
Austin-Western Road Machinery Co., Chicago, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Easton Car and Construction Co., Easton, Pa.
Smith Engineering Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.
Weller Mfg. Co., Chicago, Ill.

Blasting Powder
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio
Hercules Powder Co., Wilmington, Del.

Boiler Insulation
Celite Products Co., Chicago, Ill.

Boilers (Water Tube)
Jackson & Church Co., Saginaw, Mich.

Box Car Loaders
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Brick Machinery
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Jackson & Church Co., Saginaw, Mich.
Shope Brick Co., Portland, Ore.

Buckets (Elevator and Conveyor)
American Manganese Steel Co., Chicago Heights, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, Ohio
Lewistown Fdy. & Machine Co., Lewistown, Pa.
Smith Engineering Works, Milwaukee, Wis.
Taylor Wharton Iron & Steel Co., High Bridge, N. J.
W. Toepfer & Sons Co., Milwaukee, Wis.
Weller Mfg. Co., Chicago, Ill.

Buckets (Grab, Clambshell, etc.)
Brown Hoisting Mchy. Co., Cleveland, Ohio
Bucyrus Co., S. Milwaukee, Wis.
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, Ohio

Burr Mills
Butterworth & Lowe, Grand Rapids, Mich.
Munson Mill Machinery Co., Utica, N. Y.

Cableways
Interstate Equipment Corp., New York, N. Y.

Calcining Kettles (Gypsum)
American Process Co., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.

Car Pullers
Ottumwa Box Car Loader Co., Ottumwa, Iowa
Thomas Elevator Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Cars (Quarry)
Atlas Car & Mfg. Co., Cleveland, Ohio
Easton Car and Construction Co., Easton, Pa.
United Iron Works, Inc., Kansas City, Mo.
Western Wheeled Scraper Co., Aurora, Ill.

Chain (Steam Shovel)
Carroll Chain Co., Columbus, Ohio

Chain Drives
Dodge Mfg. Corp., Mishawaka, Ind.
Link-Belt Co., Chicago, Ill.

Clamps
Knox Mfg. Co., Philadelphia, Pa.

Clutches
Dodge Mfg. Corp., Mishawaka, Ind.
The Hill Clutch Co., Cleveland, Ohio

Coal Pulverizing Equipment
Fuller-Lehigh Co., Fullerton, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Colors (Cement and Mortar)
C. K. Williams & Co., Easton, Pa.

Conveyors and Elevators
Austin-Western Road Machinery Co., Chicago, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Dodge Mfg. Corp., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, Ohio
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Smith Engineering Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
W. Toepfer & Sons Co., Milwaukee, Wis.
United Iron Works, Inc., Kansas City, Mo.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Mchy. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Core Drilling
Pennsylvania Drilling Co., Pittsburgh, Pa.

Couplings
Knox Mfg. Co., Philadelphia, Pa.

Cranes (Crawler)
Brown Hoisting Mchy. Co., Cleveland, Ohio
Bucyrus Co., S. Milwaukee, Wis.
Byers Machine Co., Ravenna, Ohio
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Koehring Co., Milwaukee, Wis.
Link-Belt Co., Chicago, Ill.
McMyler Interstate Co., Cleveland, Ohio
Northwest Engineering Co., Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., Marion, Ohio

Cranes (Locomotive)
American Hoist & Derrick Co., St. Paul, Minn.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Bucyrus Co., S. Milwaukee, Wis.
Byers Machine Co., Ravenna, Ohio
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Link-Belt Co., Chicago, Ill.
Northwest Engineering Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, Ohio
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., Marion, Ohio

Cranes (Overhead Electric Traveling)
Morgan Engineering Co., Alliance, Ohio

Crushers (Hammer)
Jeffrey Mfg. Co., Columbus, Ohio
Pennsylvania Crusher Co., Philadelphia, Pa.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Austin-Western Rd. Mchy. Co., Chicago, Ill.
C. G. Buchanan Co., New York City
Butterworth & Lowe, Grand Rapids, Mich.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Lewistown Fdy. & Machine Co., Lewistown, Pa. (Jaw)
Morgan Engineering Co., Alliance, Ohio
New Holland Machine Co., New Holland, Pa.
Smith Engineering Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
United Iron Works, Inc., Kansas City, Mo.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Mchy. Co., Kingston, N. Y.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo. (Jaw)
Western Wheeled Scraper Co., Aurora, Ill.
Worthington Pump & Mchy. Corp., New York City

Crusher Protectors
Dings Magnetic Separator Co., Milwaukee, Wis.

Crushing Rolls
C. G. Buchanan Co., New York City
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
McLanahan Stone Machine Co., Hollidaysburg, Pa.
New Holland Machine Co., New Holland, Pa.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
United Iron Works, Inc., Kansas City, Mo.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo.
Worthington Pump & Mchy. Corp., New York City

Derricks
Thomas Elevator Co., Chicago, Ill.

Dippers and Teeth (Steam Shovel)
American Manganese Steel Co., Chicago Heights, Ill.
Bucyrus Co., S. Milwaukee, Wis.
Taylor Wharton Iron & Steel Co., High Bridge, N. J.

Draglines
Bucyrus Co., S. Milwaukee, Wis.
Erie Steam Shovel Co., Erie, Pa.
Koehring Co., Milwaukee, Wis.
Northwest Engineering Co., Chicago, Ill.
Osgood Co., Marion, Ohio

Dragline Cableway Excavators
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.

Dredge Chain
Carroll Chain Co., Columbus, Ohio

Dredges (Hydraulic)
Ellicott Machine Corp., Baltimore, Md.

Dredges (Sand and Gravel)
American Manganese Steel Co., Chicago Heights, Ill.
Bucyrus Co., S. Milwaukee, Wis.
Ellicott Machine Corp., Baltimore, Md.
Morris Machine Works, Baldwinsville, N. Y.
Thomas Elevator Co., Chicago, Ill.

Drills (Blast Hole)
Armstrong Mfg. Co., Waterloo, Iowa
Sanderson-Cyclone Drill Co., Orrville, Ohio

Dryers
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Process Co., New York, N. Y.
Buckeye Dryer Co., Chicago, Ill.
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Kennedy-Van Saun Mfg. and Eng. Corp., New York, N. Y.
Lewistown Fdy. & Machine Co., Lewistown, Pa.
McGann Mfg. Co., York, Pa.
Ruggles-Coles Eng. Co., New York, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

Dust Collecting Systems
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Dynamite
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio
Hercules Powder Co., Wilmington, Del.

Engineers
J. C. Buckbee Co., Chicago, Ill.
Robt. W. Hunt & Co., Chicago, Ill.
Kritzer Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
McGann Mfg. Co., York, Pa.
H. Miscampbell, Duluth, Minn.
Pennsylvania Drilling Co., Pittsburgh, Pa.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.
R. D. Wood & Co., Philadelphia, Pa.

Engines (Gasoline, Kerosene and Oil)
American Hoist & Derrick Co., St. Paul, Minn.
Armstrong Mfg. Co., Waterloo, Iowa
Climax Engineering Co., Clinton, Iowa
Power Mfg. Co., Marion, Ohio
Worthington Pump & Mchy. Corp., New York City

Traffic and Transportation—*Continued from Page 70*

To	Present	Proposed
Thalmann, Ga.	$.18	$.19½
Offerman, Ga.	.19½	.21½
Douglas, Ga.	.18	.21½
Double Run, Ga.	.17½	.19½

Approved from Birmingham, Boyles and N. Proposed rates are the same as recent 17 Birmingham, Ala., and will place rates from Spocari, Ala., on the proper basis as compared with other points named.

11040. Sand, C. L., minimum weight marked capacity of car, from Birmingham, Ala., and Group to Lawrenceville, Ga. Present rate, 33 cents per 100 lb.; proposed rate, $1.44 per net ton, made on basis of the mileage scale proposed in Georgia and Alabama on common sand for S. A. L. Ry., distance of 200 miles, Birmingham to Lawrenceville.

11044. Cement, carloads, from Kingsport, Tenn., to Coreen, Ga. Present rate, 26 cents; proposed, 21 cents per 100 lb., made on basis of scale it is proposed to use in connection with general revision of cement rates.

Southwestern Freight Bureau

9281. Stone, crushed. To establish rate of 12 cents per 100 lb. on crushed stone, minimum weight 50,000 lb., or marked capacity of car if less than 50,000 lb., from Dittlinger, Tex., to Elizabeth, La. Remarks: Proposed rate is predicated on the rate in Texas for same distance; namely, 392 miles. This is the same rate as would obtain under 9702 scale.

9287. Lime. To establish the following rates in cents per 100 lb. on lime, C. L., minimum weight 30,000 lb.: From Ashgrove, Galloway, Joplin, Osceola, Pierce City, Phoenix and Springfield, Mo., to

	Cents
N. O. T. & M. R. R. points, Kinder, La., to Port Barre, La., inclusive	31
N. I. & N. points	31½
Alexandria, La., on the Sou. Pac. Lines of Texas	25½
Sou. Pac. Lines of Texas, Moreland, La., to New Ibera, La., inclusive	31½
From Johnson, Ark., to	Cents
N. O. T. & M. R. R. points, Kinder, La., to Port Barre, La., inclusive	29½
N. I. & N. points	30
Alexandria, La., on Sou. Pac. Lines of Texas	24
Sou. Pac. Lines of Texas, Moreland to New Ibera, La., inclusive	30

Remarks: The above proposition contemplates establishing from Missouri lime producing points to stations on the N. O. T. & M. and M. L. & T. lines rates that are 1½ cents per 100 lb. higher than the rates proposed from Ruddells, Ark., this being the difference generally carried to Louisiana points. It also further contemplates establishing from Johnson, Ark., the same rates as suggested from Ruddells, which is the accepted basis.

9346. Lime. To establish on lime, C. L., minimum weight 30,000 lb., from Johnson, Ark., to stations on the K. O. & G. Ry. Ships to Red River, inclusive, rates 2 cents per 100 lb. lower than published from Ash Grove-Springfield Group points. Remarks: Proposed change claimed necessary to place rates from Johnson to these points on a proper relation to rates in effect from the Ash Grove-Springfield district.

9366. Cement. To establish rate of 33 cents per 100 lb. on cement, except asbestos or mortar color cement, carloads, minimum weight 50,000 lb., from Ada and Hartshorne, Okla., to points on C. & N. E. Ry., north of Cisco, Texas; points on E. W. F. & G. Ry., north of Eastland, Texas; to points on W. F. R. & Ft. W. Ry., north of Rander, Texas, and points on W. F. & S. Ry., south of Graham, Texas.

9368. Cement. To establish rate of 25½ cents per 100 lb. on cement, as described in S. W. L. Trf. 90D, carloads, from Ada, Okla., to Mobile, Ala., for export or coastwise movement.

9390. Asphalt Coated Stone, Sand or Gravel. To establish on asphalt coated stone, sand and gravel, carloads, minimum weight marked capacity of car used, except where cars are loaded to full visible space carrying capacity, in which case actual weight will govern, from Sandune, Texas, to Louisiana points on Gulf Coast Lines, the same scale of rates as applicable on stone, sand and gravel, as per paragraph A of Item 1750, Texas Lines Trf. 2H, this being the scale prescribed by the Interstate Commerce Commission in the Shreveport case, Docket 8418, and in Natchez case, Docket 8845. Remarks: This commodity consists of stone, sand and gravel with approximately 12 per cent asphalt and it is claimed the rates should not be higher than prescribed on stone, sand and gravel between Shreveport and Texas in Docket 8814.

Western Trunk Line

3361. Sand, C. L., from Red Wing, Minn., and Eau Claire, Wis., to Memphis, Tenn. Present, 51½ cents (Class E); proposed, 23 cents. Minimum weight, capacity of car.

3363. Asphalt Sand, C. L., from Colona, Ill., to Iowa City, Iowa. Present, $2.10 per ton of 2000 lb.; proposed, $1.20 per ton of 2000 lb. Minimum weight 90 per cent of the marked capacity of car, except when car is loaded to full visible capacity, actual weight but not less than 50,000 lb. will apply.

3376. Crushed Stone (granite), C. L., from Berlin and Utley, Wis., to Keokuk, Iowa. Present, 14½ cents per 100 lb.; proposed, 11½ cents per 100 lb. Minimum weight 90 per cent of marked capacity of car but not less than 40,000 lb.

3385. Lime, C. L., from Cedarburg, Wis., Group, Milwaukee and Waukesha, Wis., to Ft. Dodge, Iowa, via Huxley, Iowa, and Ft. D. D. M. & S. Present, 19½ cents per 100 lb., minimum weight 30,000 lb.; proposed, 14 cents per 100 lb., minimum weight 60,000 lb.

3386. Lime, C. L., from Port Byron, Ill., to Ft. Dodge, Iowa, via Huxley, Iowa, and Ft. D. D. M. & S. Present, 19½ cents per 100 lb., minimum weight 30,000 lb.; proposed, 10 cents per 100 lb., minimum weight 60,000 lb.

Trunk Line Association

11607. (1) Sand, blast, engine, foundry, glass, molding and silica, C. L. (2) Sand, other than blast, engine, foundry, glass, molding and silica, C. L., minimum weight 90 per cent of marked capacity of car, except when car is loaded to cubical or visible capacity, actual weight will apply from stations on Raritan River R. R. to Portsmouth, Va., $4.32 per net ton on (1) and $3.90 per net ton on (2).

11610. Sand and Gravel, C. L., minimum weight 90 per cent of marked capacity of car, except when car is loaded to cubical or visible capacity, actual weight will apply, from Attica, N. Y., to Riverside, N. Y., and Gilmore, Pa., $1.10 and $1.75 per net ton, respectively.

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

Engines (Steam)
American Hoist & Derrick Co., St. Paul, Minn.
Ellicott Machine Corp., Baltimore, Md.
Jackson & Church Co., Saginaw, Mich.
Morris Machine Works, Baldwinsville, N. Y.

Explosives (See Blasting Powder and Dynamite)

Frogs and Switches
Central Frog & Switch Co., Cincinnati, Ohio
Easton Car and Construction Co., Easton, Pa.

Fuses (Detonating and Safety)
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio
Hercules Powder Co., Wilmington, Del.

Gas Producers
Morgan Construction Co., Worcester, Mass.
R. D. Wood & Co., Philadelphia, Pa.

Gears (Spur, Helical, Worm)
Falk Corp., Milwaukee, Wis. (Helical)
Taylor Wharton Iron & Steel Co., High Bridge, N. J.

Grizzlies
Robins Conveying Belt Co., New York City
W. Toepfer & Sons Co., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Western Wheeled Scraper Co., Aurora, Ill.

Gypsum Plaster Plants
Butterworth & Lowe, Grand Rapids, Mich.

Hoists
American Hoist and Derrick Co., St. Paul, Minn.
Hyman-Michaels Co., Chicago, Ill.
Industrial Works, Bay City, Mich.
Jackson & Church Co., Saginaw, Mich.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

Hose Menders
Knox Mfg. Co., Philadelphia, Pa.

Hydrators (Lime)
Kritzer Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
H. Miscampbell, Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Insulation (Heat)
Celite Products Co., Chicago, Ill.

Kilns (Rotary)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
McGann Mfg. Co., York, Pa.
H. Miscampbell, Duluth, Minn.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

Kilns (Shaft)
McGann Mfg. Co., Inc., York, Pa.
H. Miscampbell, Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Lime Handling Equipment
Kritzer Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
H. Miscampbell, Duluth, Minn.
Raymond Bros., Impact Pulv. Co., Chicago, Ill.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Sturtevant Mill Co., Boston, Mass.

Liquid Fuel Equipment
W. N. Best Corp., New York City

Loaders and Unloaders
Brown Hoisting Mchy. Co., Cleveland, Ohio
Hoar Shovel Co., Duluth, Minn.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago, Ill.
Northwest Engineering Co., Chicago, Ill.
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Locomotives (Steam, Gas, and Electric)
Baldwin Loco. Wks., Philadelphia, Pa. (Steam)
Davenport Loco. Wks., Davenport, Iowa (Steam and Gas)
Fate-Root-Heath Co., Plymouth, Ohio (Gas)
Ironton Eng. Co., Ironton, Ohio (Electric)
Jeffrey Mfg. Co., Columbus, Ohio (Electric)
Lima Locomotive Works, Lima, Ohio (Steam)
Milwaukee Loco. Mfg. Co., Milwaukee, Wis. (Gas)
Vulcan Iron Works, Wilkes-Barre, Pa. (Steam)

Lubricating Systems
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Magnetic Devices (Pulleys, etc.)
Dings Magnetic Separator Co., Milwaukee, Wis.

Manganese Steel (Castings, Repair Parts, etc.)
American Manganese Steel Co., Chicago Heights, Ill.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Taylor Wharton Iron & Steel Co., High Bridge, N. J.

Mills, Grinding (Ball, Tube, etc.)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bradley Pulverizer Co., Allentown, Pa.
Jackson & Church Co., Saginaw, Mich.
Lewistown Fdy. & Machine Co., Lewistown, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Worthington Pump & Mchy. Corp., New York City

Nipples
Knox Mfg. Co., Philadelphia, Pa.

Nozzles
Knox Mfg. Co., Philadelphia, Pa.

Perforated Metal
Cross Engineering Co., Carbondale, Pa.
Harrington & King Perforating Co., Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
W. Toepfer & Sons Co., Milwaukee, Wis.

Pipe (Dredge, etc.)
R. D. Wood & Co., Philadelphia, Pa.

Portable Conveyors
Jeffrey Mfg. Co., Columbus, Ohio

Portable Engines
Climax Engineering Co., Clinton, Iowa

Power Units
Climax Engineering Co., Clinton, Iowa

Pulleys
The Hill Clutch Co., Cleveland, Ohio

Pulleys (Magnetic)
C. G. Buchanan Co., New York, N. Y.

Pulverizers
Bradley Pulverizer Co., Allentown, Pa.
Fuller-Lehigh Co., Fullerton, Pa.
Jeffrey Mfg. Co., Columbus, Ohio
K-B Pulverizer Co., Inc., New York City
Kent Mill Co., Brooklyn, N. Y.
Munson Mill Machinery Co., Utica, N. Y.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Crusher Co., Cedar Rapids, Iowa
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Ellicott Machine Corp., Baltimore, Md.
Morris Machine Works, Baldwinsville, N. Y.

Pumps (Water, etc.)
Emerson Pump and Valve Co., Alexandria, Va.
Morris Machine Works, Baldwinsville, N. Y.
Pennsylvania Pump and Compressor Co., Easton, Pa.
United Iron Works, Inc., Kansas City, Mo.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo.
Worthington Pump & Mchy. Corp., New York City

Rails
Easton Car and Construction Co., Easton, Pa.

Road Machinery
Austin-Western Rd. Mchy. Co., Chicago, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Bucyrus Co., S. Milwaukee, Wis.
Koehring Co., Milwaukee, Wis.
Northwest Engineering Co., Chicago, Ill.
Universal Road Mchy. Co., Kingston, N. Y.
Western Wheeled Scraper Co., Aurora, Ill.

Scales (See Weighing Equipment)

Scrapers (Drag, etc,)
Austin-Western Rd. Mchy. Co., Chicago, Ill.
Northwest Eng. Co., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.

Screens
Austin-Western Rd. Mchy. Co., Chicago. Ill.
Cleveland Wire Cloth Co., Cleveland, Ohio
Cross Engineering Co., Carbondale, Pa.
Dodge Mfg. Corp., Mishawaka, Ind.
Harrington & King Perforating Co., Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Kent Mill Co., Brooklyn, N. Y.
Link-Belt Co., Chicago, Ill.
McLanahan Stone Machine Co., Hollidaysburg, Pa.
Robins Conveying Belt Co., New York City
Smith Engineering Wks., Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
W. Toepfer & Sons Co., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.
W. S. Tyler Co., Cleveland, Ohio
United Iron Works, Inc., Kansas City, Mo.
Universal Crusher Co., Cedar Rapids, Iowa
Weller Mfg. Co., Chicago, Ill.
Western Wheeled Scraper Co., Aurora, Ill.
Williams Pat. Crush. & Pulv. Co., St. Louis, Mo.

Screens (Electric Vibrating)
W. S. Tyler Co., Cleveland, Ohio

Separators (Magnetic)
C. G. Buchanan Co., New York, N. Y.
Dings Magnetic Separator Co., Milwaukee, Wis.

Shafting
The Hill Clutch Co., Cleveland, Ohio

Shovels (Steam, Gas and Electric)
Bucyrus Co., S. Milwaukee, Wis.
Erie Steam Shovel Co., Erie, Pa.
Hoar Shovel Co., Duluth, Minn.
Koehring Co., Milwaukee, Wis.
Northwest Engineering Co., Chicago, Ill.
Osgood Co., Marion, Ohio

Sprockets and Chain
American Manganese Steel Co., Chicago Heights, Ill.
Dodge Mfg. Corp., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, Ohio
Taylor Wharton Iron & Steel Co., High Bridge, N. J.

Steel Plate Construction
Hendrick Mfg. Co., Carbondale, Pa.
Jackson & Church Co., Saginaw, Mich.

Testing Sieves and Shakers
W. S. Tyler Co., Cleveland, Ohio

Track Equipment
Central Frog and Switch Co., Cincinnati, Ohio
Easton Car and Construction Co., Easton, Pa.
Western Wheeled Scraper Co., Aurora, Ill.

Tramways (Aerial Wire Rope)
Interstate Equipment Corp., New York City.
A. Leschen & Sons Rope Co., St. Louis, Mo.

Transmission Machinery
Dodge Mfg. Corp., Mishawaka, Ind.
The Hill Clutch Co., Cleveland, Ohio
Kritzer Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Underground Loaders
Hoar Shovel Co., Duluth, Minn.

Valves (Throttle)
Emerson Pump and Valve Co., Alexandria, Va.
Knox Mfg. Co., Philadelphia, Pa.

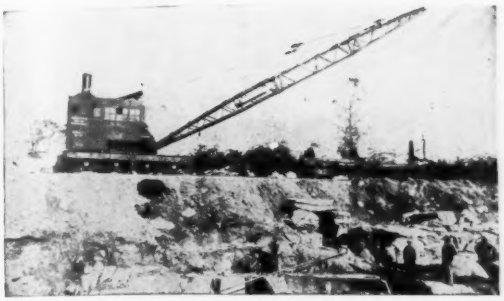
Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Lewistown Fdy. & Machine Co., Lewistown, Pa.
Link-Belt Co., Chicago, Ill.
McLanahan Stone Machine Co., Hollidaysburg, Pa.
Smith Engineering Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.

Weighing Equipment
Richardson Scale Co., Passaic, N. J.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Wheels (Car)
Easton Car and Construction Co., Easton, Pa.
Taylor Wharton Iron & Steel Co., High Bridge, N. J.

Wire Cloth
Cleveland Wire Cloth Co., Cleveland, Ohio
Twin City Iron & Wire Works, St. Paul, Minn
W. S. Tyler Co., Cleveland, Ohio

Wire Rope
American Steel & Wire Co., Chicago, Ill.
Armstrong Mfg. Co., Waterloo, Iowa
A. Leschen & Sons Co., St. Louis, Mo.
Williamsport Wire Rope Co., Williamsport, Pa.



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of today are the development of 50 years' experience in design and construction of locomotive cranes.

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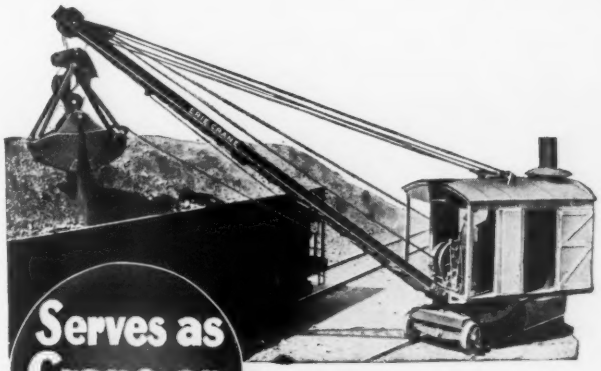
New York Chicago Philadelphia Detroit

SALES ENGINEERS IN ALL PRINCIPAL CITIES

1873 BUILDERS OF CRANES FOR 50 YEARS 1923



Serves as Crane or Steam Shovel

Every ERIE can be quickly and easily changed over to a Locomotive Crane. Gives excellent service with clamshell bucket—excavates gravel, loads cars, handles storage, etc.

In the hardest steam shovel service, gravel producers and quarrymen have found the ERIE very sturdy and reliable.

"Our first ERIE has been digging hard gravel for 3 years without any repairs. We have in the past operated other steam shovels that are good, but the ERIE is the best, being by far the most substantial." Write the Standard Builders' Supply Co., Grand Rapids, Mich. They own 2 ERIES, a Steam Shovel and a Crane.

Write for Bulletin P-16, showing just what you can do with the ERIE, both as crane and steam shovel.

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.

Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels

Flirting With the Shovels

In the game of crushed stone quarrying a drill that is within flirting distance with steam shovel or the loading gangs is in a dangerous position. A breakdown on the drill, and the whole production schedule is upset.

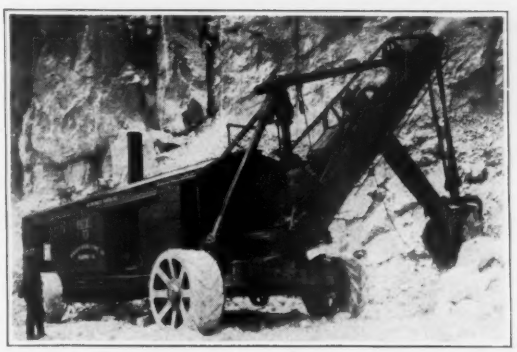
No. 14 Cyclone Drills, on the job, always keep plenty of stone ahead, and if they should ever be crowded there is no need for worry—the working parts are cast steel, reducing to the very minimum all possibility of breakdowns.

Write for "Big Blast Hole Drills," a semi-technical treatise on quarry drilling and also containing a complete description of Cyclone No. 14 Big Blast Hole Drills.

The Sanderson-Cyclone Drill Co.

Orrville, Ohio

Eastern and Export Office: 30 Church Street, New York City



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Almost Too Good to Be True

is the way an owner of a Railroad type Steam Shovel characterized the New Traction Wheel Mountings for Railroad Shovels. But it IS true. The largest type of Railroad Steam Shovel has been successfully mounted on traction wheels. We have some data that will interest you. Ask for Bulletin 235.

1½ to 6 yd. Railroad Type Steam Shovels
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The OSGOOD Company

Marion, Ohio

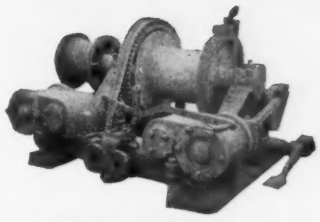
A Clamshell Crane Crossed with a Mountain Goat

That just about describes the qualifications of the "AMERICAN" Ten Ton cranes used by the Lock Joint Pipe Co., for handling concrete aggregate and trench excavation with a ¾-yard clamshell bucket. One of these cranes went down and up the 20 per cent banks of a creek without the least trouble.

The "AMERICAN" Ten Ton Crane on Continuous Chain Treads will travel all over the lot quickly and slickly without a track or a single pit man. Big savings are bound to result from its use.

AMERICAN
HOIST & DERRICK CO.
Saint Paul, Minn.
New York - Chicago - Pittsburgh - Seattle - New Orleans - Detroit

FOR SALE



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Capacity, 10,000 Pounds
IMMEDIATE SHIPMENT

Detailed Specifications Furnished on Application
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Relaying rails and angle bars, all weights and tonnages, for prompt shipment. Get our quotations

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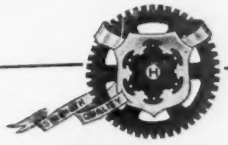
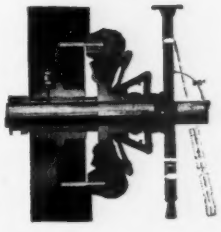
By using "Era" Repair Parts—they are made of Manganese Steel and completely fill the bill as they are able to stand up and deliver the kind of service you have always thought impossible.

"Era" Repair Parts have proved their ability to wear longer wherever they are in use. It will pay you to write for description and prices.

The Hadfield-Penfield Steel Company
Bucyrus, Ohio

MANGANESE
THE FIRST ERA STILL LEADS IN QUALITY
STEEL
THE HADFIELD-PENFIELD STEEL COMPANY
BUCYRUS, OHIO





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When desired we will forward sketch showing layout of equipment quoted upon.

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1—8x125 ft. Rotary Kiln
2—7x5½x60 ft. Rotary Dryers
1—5½x22 ft. Tube Mill
1—4x16 ft. Tube Mill
1—5x9 ft. Tube Mill
2—33 in. Fuller Mills
1—Williams No. 2 Deck Sweeper
1—No. 3 Williams Mill—Lawrence Pattern
1—No. 4 Williams Mill
1—No. 5 Williams Mill—Jumbo
2—12 ton, 36 in. gauge, Porter Saddle Tank Locomotives
1—Browning Standard Combination Drag Line and Shovel, 2½ yd. bucket
1—Belt Driven Hoist, Drum 5x5 ft.

EQUIPMENT SALES COMPANY
Nashville, Tennessee
"If we don't have it we will get it"

1—50-ton standard gauge Brooks 6-wheel switcher.
1—28-ton standard gauge Shay geared locomotive.
2—10x16" 36" gauge 4-wheel saddle tank locomotives.
2—9x14" 36" gauge 4-wheel saddle tank locomotives.
1—14-B Bucyrus steam shovel, mounted on traction wheels.
2—18-ton O&S bucket handling locomotive cranes.
10 Miles 30-lb. and 35-lb. relay steel rails, Natalbany, La.

Birmingham Rail and Locomotive Co.
Birmingham, Ala.

FOR SALE

1—70 ton Steam Shovel
15—5 ton steel body, end dump, heavy duty standard gauge Quarry Cars.
1—Switching Locomotive, standard gauge.
1—No. 6K Gates Crusher
1—No. 4B Gates Crusher

All in good working order. Low prices to move quickly

INLAND CRUSHED STONE CO.
105 North Clark Street Chicago, Ill.

FOR SALE

5 5x6x7x110′ Rotary KILNS.
5 5x21′ Tube Mills (1 has Silax Lining, 3 Steel Lining, 1 without Lining).
2 No. 8 Ball Mills.
1 4x40′ Coal Dryer.
1 No. 6 Gates Crusher.
2 5½x22′ Smidth Tube Mills.
2 No. 66 Smidth Kominuters.
2 6x60′ Rotary Dryers.
1 Lathe, 26" Swing, 16′ Bed.
2 Automatic Weighing Machines.
3 Roll Leather Belting, 3-ply, 46"x 242′. And lot of Miscellaneous Equipment.

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Sand Lime Brick Machinery

One Four Mold Boyd Press
One Abbe Engineering Co. TUBE MILL—spiral feed, 17x5 ft.
One Sturtevant ROTARY LIME CRUSHER, No. 1
Eighty Steel Cars—capacity 850 Brick each, 28-in. gauge
One Air Blower, 24-in. diam. "American"
For full description and prices, address

Winchester Granite Brick Co.
Dudley, Ky.

SPECIAL BARGAINS

Send Us Your Boiler Inquiries

66x86 in. TRAYLOR JAW CRUSHING PLANT.
25-50-80-110 HP. Elec. Hoists.
Nos. 4-5-6-7½-9 and 10 CRUSHERS.
6 and 10 ton Gasoline Locomotives.
2-DISC CRUSHERS, 24 and 36 in.
100 TON 2½ yd. ELECTRIC SHOVEL.
50-5000 ft. Steam Belt and Electric Compressors.
13x30 in.; 10x18 in.; 8x14 in. JAW CRUSHERS.
24x54 McLANAHAN ROLL CRUSHERS.
50 HP. D. D. HOIST, 440 V. 3 Ph. Motor Dragline Set: Also 25 HP. Dragline Equip.
100 HP. LOCO. TYPE BOILER, 125 lb.
3 60-HP. GASOLENE S-D HOISTS, PRAC. NEW.
10 and 12 ton ROAD ROLLERS.
5-7½ and 10 HP. PORTABLE CONVEYORS.
750-1000 GPM. UNDERWRITERS STEAM PUMPS.
Dryers, Pulverizers, Locomotive Cranes, Shovels.

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ROSS POWER EQUIP. COMPANY
Indianapolis, Ind.

ROTARY DRYERS

30 New Direct-Fired Rotary Dryers, 4′-0" diam., 30′-0" long. These Dryers were about to be put into operation as the armistice was signed, and consequently were never used. We are offering them at a sacrifice, complete with driving mechanism, furnace irons, grates, etc. Some are equipped with steam radiators, for steam heated air drying.

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Allentown, Penna.

FOR SALE

Plymouth Gasoline Locomotive, 24" gauge, Model AL No. 326, in very good condition. Inquire of

THE SMALLWOOD-LOW STONE CO.
Lisbon, Ohio

WANTED

Wood-fiber machine for cutting wood-fiber for plaster. Give complete specifications and state condition of machine and price.

Box 1699, care of Rock Products
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Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Type ads only. No cuts or illustrations permitted unless at the regular display advertising rates. Please send check with order. These ads must be paid for in advance of insertion

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½x25′, 4x30′, 5½x50′, 6x60′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 4x40′, 5x50′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 5x4′, 3x3½′ pebble and ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 12x26″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24″, 36″ and 40″ cage mills; 3′ and 4½′, 6′ and 8′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

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Air compressors.

W. P. Heineken, Engineer
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FOR SALE

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7½D—Gates Gyratory Crusher
No. 10 McCully Gyratory Crusher
48″x20′ Revolving Manganese Screen.

ARTHUR S. PARTRIDGE
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For Sale—Steam Shovels

1—70 C. Bucyrus, 2½ yd. Bucket.
1—60 Marion, 2½ yd. Bucket.
Both standard gauge. Immediate shipment.

Consolidated Products Co., Inc.
15 Park Row New York, N. Y.

Mine Cars, Rails and Locomotives

We have a number of good, serviceable, standard gauge, second hand locomotives, and narrow gauged ones, for immediate shipment.

M. K. FRANK
Frick Building Pittsburgh, Pa.

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4000 lin. ft., 30-in., 20 lb. Track
12 30-in., 1½-yd. Cars
PLYMOUTH GASOLINE LOCOMOTIVE

F. WILLIAM STOCKER
Hoboken, N. J.

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3—4x23-ft. Hersey Dryers.

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FOR SALE

Machinery for making slack wood barrels, 16x28-inch, with steel hoops, stave crozier, barrel shaper with extra cage—hoop riveter—hoop expander—10-HP. Williamsport gas engine.

American Lime & Stone Company
Bellefonte, Pennsylvania

FOR SALE

Dragline Excavator, 100′ boom, 3-yd. bucket. Dragline Excavator, 80′ boom, 2½-yd. bucket. 12-ton Industrial Elec. Crane, 50′ boom.

THE PIONEER EQUIPMENT CO.
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A six-inch Swaby centrifugal sand pump, complete with suction, pipe, hose, swivel joints, valves, etc., all in good condition. Will sell at a sacrifice.

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For Sale—STEAM SHOVEL

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Thoroughly rebuilt; attractive terms for quick sale.

Walter A. Zelnicker Supply Co., St. Louis
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FOR SALE

100 ton Crushed Stone Plant — fully equipped, nicely located—good railroad facilities—well established market.

LUFKIN ROCK COMPANY
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WANTED

3—42-in. diameter, Fuller-Lehigh Mills, plow or fan discharge, in good operating condition. Address

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Vice-President, Room 603, 524 Fourth Ave.
Pittsburgh, Pa.

Position Wanted

Thoroughly experienced operator wishes to become connected permanently with large reliable firm quarrying and crushing, either hard or soft rock. Location immaterial. Permanency with future main essential. Address

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Experienced Manager

Open pit or underground quarry superintendent or manager open for employment. Fifteen years' experience. Best references. Nominal salary with share in profits produced.

Address Box 1678, care of Rock Products
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WANTED

Good machinist familiar with crushing and grinding machine. Apply

Clifford L. Miller
West Stockbridge Massachusetts

FOR SALE

Eighty acres of high calcium limestone, located at Tyndall, Manitoba, Canada, 28 miles from Winnipeg, on the Canadian Pacific R. R. Unlimited market, a splendid opportunity for a lime manufacturer. For further particulars address

James Marr, 1316 L Street, Bedford, Ind.

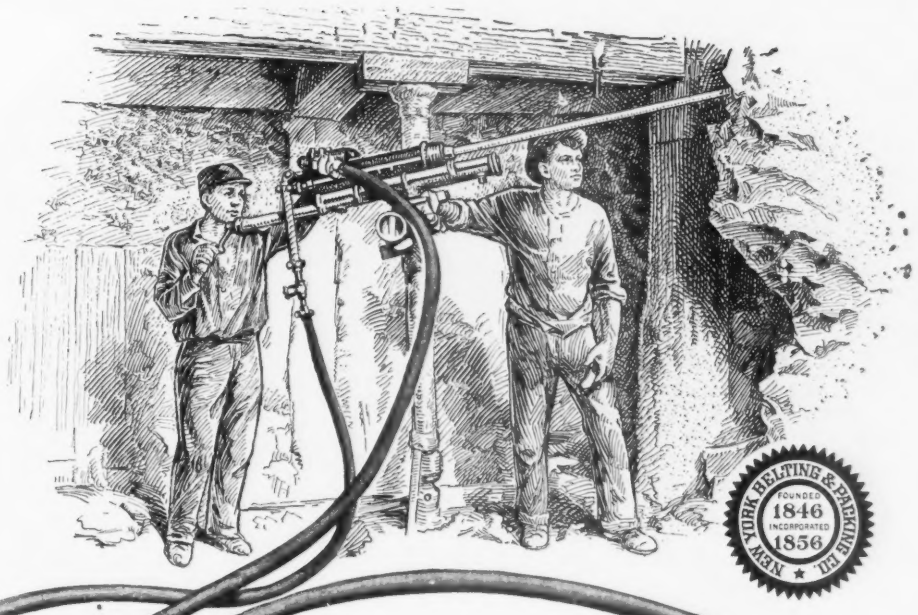
POSITION WANTED

Superintendent of wide experience, thoroughly posted on plant and quarry management. Practical knowledge of operation and upkeep of plant and quarry machinery and the development of quarry properties acquired through actual experience in handling the work in detail. Successful organizer. Conscientious worker and absolutely dependable. Will consider any proposition or location. Unquestionable references. Address

Box 1673, Care of Rock Products
542 South Dearborn Street Chicago, Illinois

Have you a plant for sale? Do you wish to purchase a plant? Are you in need of a superintendent or manager? Are you looking for a position as plant superintendent or manager? Advertise your wants in these columns for quick results.

INDEX TO ADVERTISEMENTS



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ONLY when your drills are backed by a steady flow of air at full pressure is it possible to obtain maximum production.

Because of certain definite qualities built into Indestructible Air Drill Hose, its use on your drills will assure uninterrupted driving power.

The great strength of the hose is but one of several features. It is guarded against expansion and kinking by a specially woven fabric jacket over which the rubber cover is applied. This also makes for flexibility which is appreciated when working in close quarters. Short bends will not kink it—you cannot blow it out with many times the average working pressure.

Your drills will remain continuously on the job—with production correspondingly increased—because the air keeps coming.

NEW YORK BELTING & PACKING CO.

Rubber Goods for the Rock Products Industry

New York Boston Chicago Philadelphia
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INDESTRUCTIBLE AIR DRILL HOSE

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

Tradepress Publishing Corporation

542 South Dearborn Street, Chicago, Illinois

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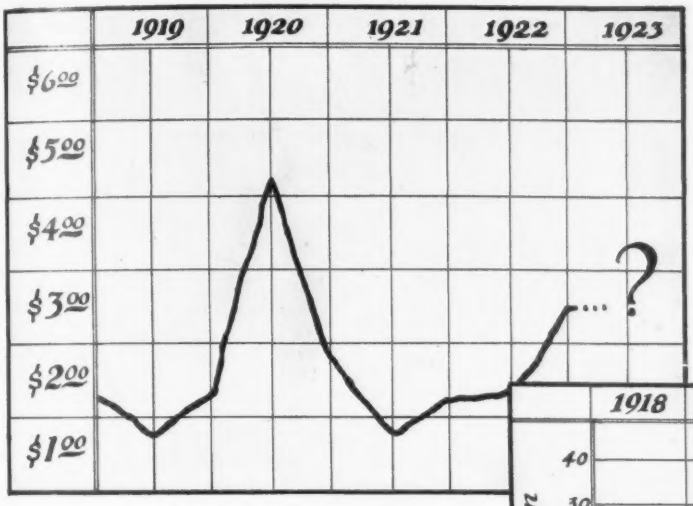
Volume 26 September 22, 1923 Number 19

CONTENTS

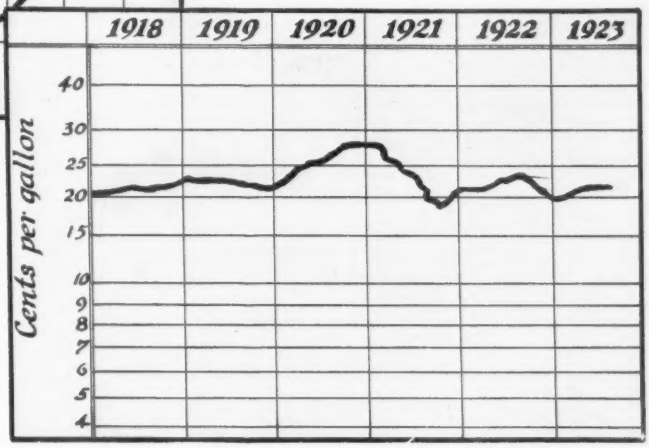
What does shovel fuel cost you?

Coal prices from Coal Age



Coal cost per ton
Note tendency to rise

Gasoline chart from Motor Age



Gasoline cost per gallon. Note even trend

The mere fact that coal prices show a degree of unusual fluctuation with a steady upward trend from year to year, while gasoline remains comparatively steady, should be sufficient to cause you to consider the economy of Northwest Gas Shovel. And now due to the recent low prices of gasoline, Northwest economy is greater than ever.

NORTHWEST ENGINEERING CO.
1234 Steger Building, CHICAGO

NORTHWEST

GAS or CRANES · SHOVELS · DRAGLINES ELECTRIC

Eliminate the Labor Problem

In most modern brick plants the Thew Type 0 or 00 is recognized as a necessity to overcome the shortage, inefficiency and uncertainty of hand labor.

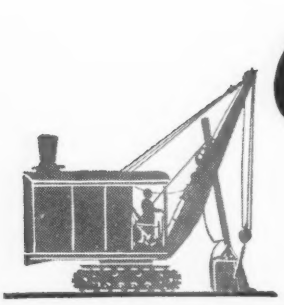
With the increasing demand many of the large Brick manufacturers have found it necessary to use larger equipment to handle the raw material and keep up production.

That is why the Walker & Frank Brick Company, of Detroit, has installed this 1 yard Thew. The A-1 with its greater capacity and power is keeping their production up to schedule at a low cost. Equipped with the continuous tread truck it can move about in slippery, boggy clay without the use of mats.

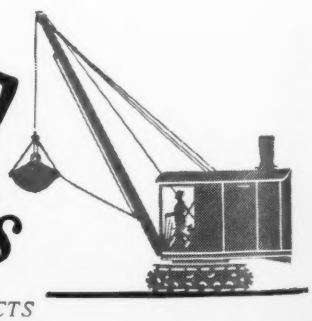
Thew Brick Yard shovels are built in three popular sizes for steam, gasoline or electric power. One of them will meet your requirements.

Write for more information.

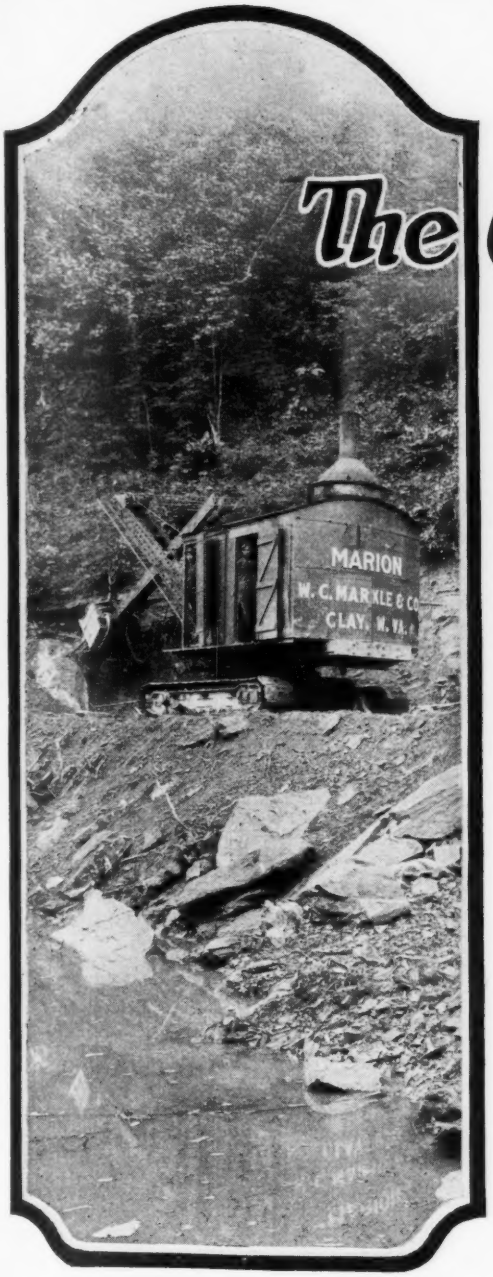
THE THEW SHOVEL COMPANY, LORAIN, OHIO



Thew
Power Shovels



When writing advertisers please mention ROCK PRODUCTS



The Only Shutdown in 3 Years

says Mr. C. W. Markle of C. W. Markle & Co., Clay, W. Va.

"was caused by a temporary suspension of our work, due, to state legislation—otherwise our Model 21 has been going strong for 3 years, *without a shut down,* in some of the toughest and hardest road work in the state. For the past six months we have been crowding our work *exceptionally* hard, *working double shift—20 hours a day.*

This will seem impossible to the contractors who do not know the *satisfaction of owning a Marion.* They may truthfully say—"Some Service — but no shovel that I have ever owned could make such a record."

But, Mr. Contractor, Marion Shovels are built to do just such performance, and they do it, not only in West Virginia, but in every state.

Three years of constant service in the mountains of West Virginia, under the most severe conditions without a shut down chargeable to the machine, is one of the best testimonials we can offer you on the *stuff that's in a Marion.*

Contractors tell us they count time as money when submitting their bids and have learned from experience that the Marion is the Shovel that does away with uncertainty, that can stand the *gaff of hard work* day after day without costly shut downs.

If you believe that shut downs are costly and must be avoided, *then you want a Marion.*

Send for our new bulletin that will acquaint you with all the latest improvements in our power shovel equipment.

EVERYWHERE RELIABLE — THE Marion STEAM SHOVEL CO. — ESTABLISHED 1884

The Marion Steam Shovel Company
Marion, Ohio

291

Marion Power Shovels

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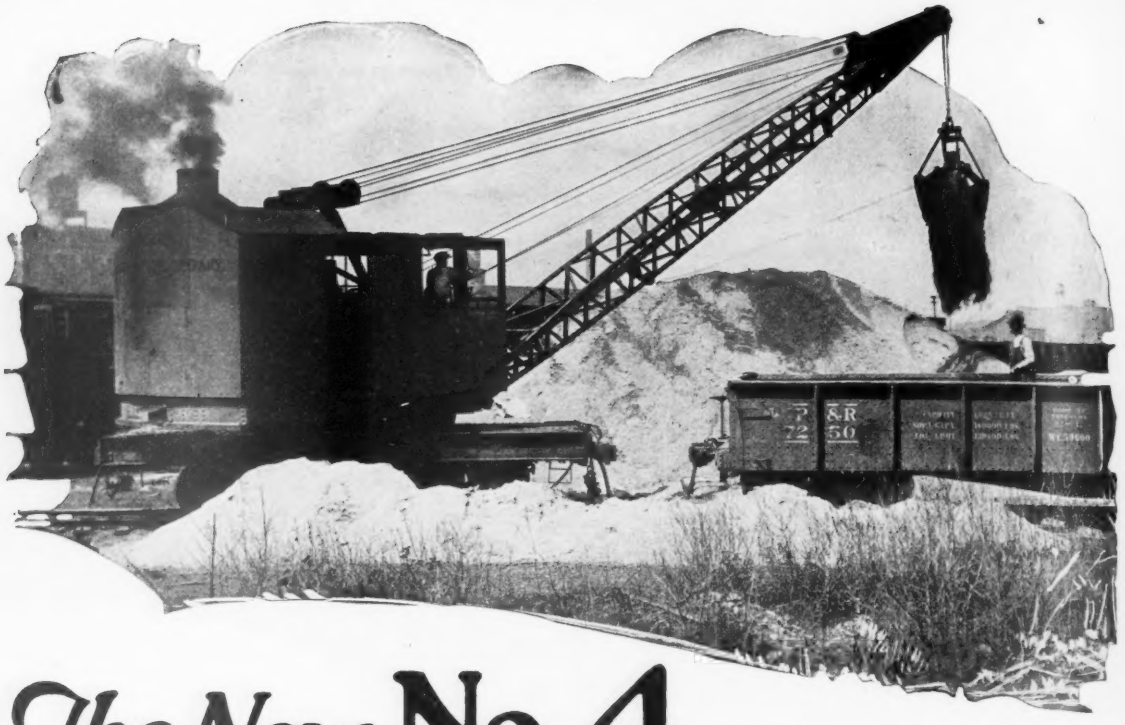

The New No. 4

McMYLER-INTERSTATE No. 4, a 20-ton crane of new design, is a modern locomotive crane. In its design and construction are embodied the experience of 40 years of crane building and study of hundreds of machines under actual working conditions. No. 4 is modern from trucks to stack; it is not a machine built from old patterns with a few added improvements.

This new crane is swift, yet easily handled. The operator has a fully enclosed cab with an unusual amount of room. His levers are at the front of the machine where he has a clear view of his work.

Simplicity in operation and ease of control are gained through the use of large friction clutches for all functions, in conjunction with a non-reversing engine. This permits any or all functions to be performed simultaneously.

No. 4 will handle a fall block, two line bucket, lifting magnet, drag line bucket or pile driving attachment. It has sufficient tractive effort to shift several loaded cars.

With its maximum single line load of 10,000 lbs., the normal hoisting speed is 300 ft. per min. The line pull available for rapid bucket work is 7500 lbs. At 12 ft. radius, with a 40-ft. boom, the crane has sufficient stability to lift 45,000 lbs.

In designing the new No. 4, full appreciation has been given to the desirability of having all parts of the mechanism readily accessible for adjustment and repair. Practically any shaft may be removed by simply taking off the two bearing caps and without disturbing any of the other mechanism. Replaceable bushings are used in all bearings.

All the gears on this crane are steel, those above the turntable having cut teeth.

The boom hoist mechanism will raise and lower the boom with maximum load specified at various radii.

May we send you Bulletin 53?

Locomotive Cranes • Pile Drivers • Derrick Cars • Car Dumpers

THE McMYLER-INTERSTATE CO. **CLEVELAND**

NEW YORK CHICAGO PITTSBURGH DETROIT

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Look for this watermark—it is our word of honor to the public

HAMMERMILL BOND

The Utility Business Paper

Browning and Hammermill

GETTING things done in American business, by means of the printed form, is the task that Hammermill Bond is accomplishing. This paper in 12 distinct, uniform colors and white, to meet every office requirement, is insuring accuracy, promptness and complete records in thousands of offices throughout the United States. It is a clean, firm paper that invites respect.

Experts in the manufacture of quality paper, by developing rigid economies in production, have enabled the Hammermill Paper Company to bring to American business the lowest-priced standard bond paper on the market.

Browning Locomotive Cranes help keep production costs at the minimum by efficient and dependable handling of logs and other heavy materials. We are justly proud of the fact that Browning is a factor in giving the public this high-grade paper.

Your factory does not need to be the size of the Hammermill plant to make a Browning a profitable investment. Let our engineers study your needs and tell you frankly whether one can serve you at a profit.

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BROWNING

LOCOMOTIVE CRANES

When writing advertisers please mention ROCK PRODUCTS

Iron like this:
wrecks crushers. Any one of the pieces shown below might have put the crusher out of business—but the Dings stood guard.

Above is shown a Dings Magnetic Pulley protecting a crusher in one of the world's largest rock fertilizer plants.

When iron reaches this point— what happens in *your* plant?

Dings protects
crushers and pulverizers in production of:
Cement
Crushed stone
Limestone
Phosphate rock
Gypsum
Blast furnace slag
Silica
Sand-lime brick
Slate

WHERE do the iron pieces that get mixed with your rock go? Do they fall into the crusher—perhaps to put it out of business, to cause costly and slow repairs, to halt production? Or are they removed safely by a Dings "High Intensity" Magnetic Pulley installed as the head pulley on the belt conveyor.

Upon your answer to this may rest the difference between profit and loss. Which will it be?

Dings Magnetic Separator Co.,
803 Smith St., Milwaukee

Dings Magnetic Separator Co., 803 Smith St., Milwaukee RP 9-22
Please send me the free Dings Pulley bulletin—no obligation
Firm.....
Address.....
Att'n.....
Coupon brings FREE book

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CLEVELAND Leader-News Bldg.
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ST. LOUIS Fed'l Reserve Bank
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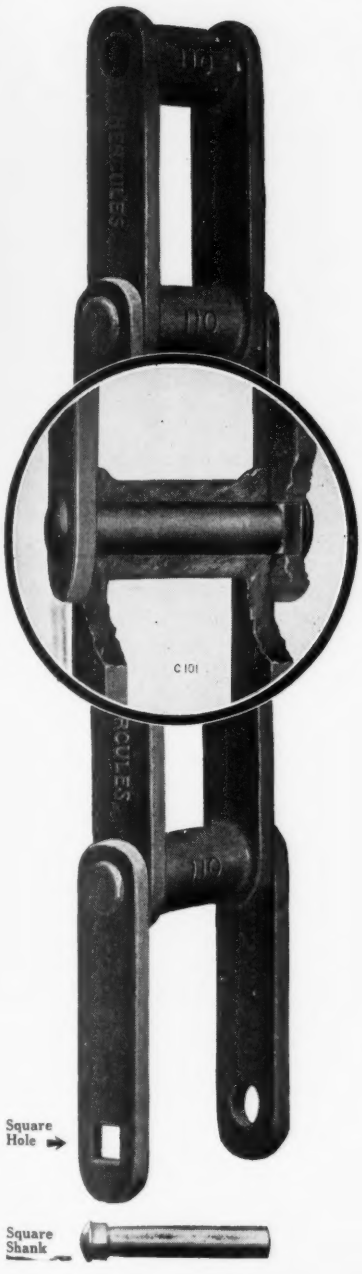
SALT LAKE CITY 201 Dooly Block

Handle Gritty, Abrasive or Corrosive Materials with Jeffrey Hercules Chain



JEFFREY Square Shank Pin Hercules Combination Malleable Iron and Steel Chain is designed especially for extra heavy work in handling gritty materials, and is also extensively used for elevating and conveying purposes.

Being a combination of both malleable block links and steel side bars with steel pins, the "Hercules" Chain is the first step to all-steel types of chain and therefore makes a very economical chain, in consideration of not only its wearing qualities, but especially of its ability to withstand shock.

It is used for drives of moderate speed. In elevator service it is usually attached to buckets in single or double strand, and in conveyors of single or multiple strands with and without pusher attachments.

The square shank pins confine the wear to inside of solid links, practically no wear to outside links. The pin is held rigidly in the Side Bars, thus distributing the wear to the long-wearing surfaces of the solid links.

The Jeffrey Mfg. Co., 935-99 North Fourth Street Columbus, Ohio

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Pittsburgh.....Rea Bldg.
Cincinnati.....42 Plum St.
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JEFFREY
MATERIAL HANDLING MACHINERY

When writing advertisers please mention ROCK PRODUCTS

New Zealand Knows The Answer!

Austin Motor Roller and Austin Scarifier giving a demonstration at Christchurch, New Zealand.

Still going strong after 10 years of active service. The Cook County, New Zealand, Council has recently added a second Austin Motor Roller to its fleet on the strength of this record.

WITH about a dozen manufacturers of steam and motor rollers in England, why do her colonies come to Chicago for their rollers in increasing numbers each year?

With high speed, four cylinder motor rollers offered at lower prices, why do experienced users stick to the slow speed, single cylinder Austin Motor Roller?

Hundreds of machines like the 10-year-old veteran in one of the photographs are the best possible answer; with their good old "one lungs" running as smoothly and silently as the day they left the factory. (Yanking around a 10-ton road roller, with no spring mounting, at three miles per hour is a far different matter from propelling a light, spring-mounted, rubber-tired automobile at sixty.)

Other reasons for the constantly increasing popularity of the Austin Motor Roller are given in Catalog "G". Your copy is ready

The Austin-Western Road Machinery Co.

Home Office: Chicago

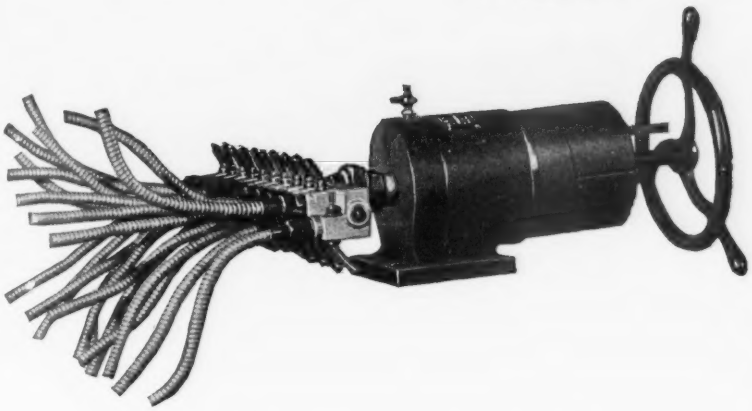
Branches in Principal Cities

10-ton Austin Motor Roller owned by the Egmont, New Zealand, County Council.

Austin Motor Roller belonging to the Piako, New Zealand, County Council driving a rock crusher.

Keystone Manifold Safety Lubricator

Patent applied for



Has already proven itself on more than 28 Different types of Machinery

IN the short time, less than six months, since we first introduced the Keystone Manifold Safety Lubricator its efficiency has been tried and proven on more than 28 different types of machinery.

The Keystone Manifold Safety Lubricator presents a method of applying grease under high pressure with pipe-line distribution to more than one bearing. It accomplishes this result without risk to the operator or waste of grease. Bearings that are difficult of access, due to small clearances between working parts, heat and other unfavorable conditions, are made easy to reach by this medium, thus insuring the proper lubrication of bearings that otherwise might be neglected because of inconvenience and hazardous conditions.

Made in Three Sizes

Capacity	Outlets
Lubricator 1 lb.	No. 1 Manifold 11
Lubricator 4 lb.	No. 4 Manifold 15
Lubricator 8 lb.	No. 8 Manifold 21

Send for booklet describing the Keystone Manifold Safety Lubricator showing typical installations

THE KEYSTONE LUBRICATING CO.

New York
Boston
Pittsburgh
Montgomery, W.Va.
Cincinnati
Knoxville
Memphis
New Orleans

Executive Office and Works:
21st & Clearfield Streets
Philadelphia, Pa.
Established 1884

Chicago
Detroit
Minneapolis
St. Louis
Kansas City
Omaha
Tulsa, Okla.
Denver
San Francisco

Agencies in Principal Countries Throughout the World

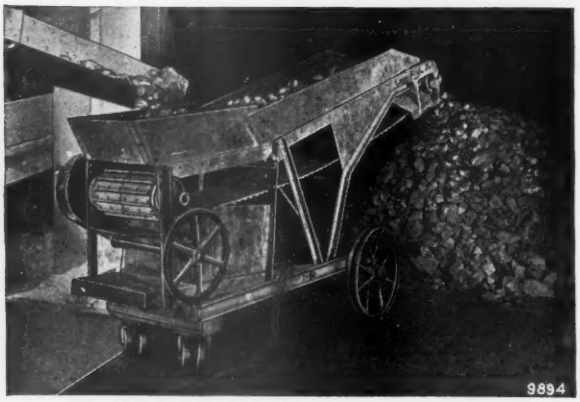
Various Types of Machinery to which the Keystone Manifold Safety Lubricator has successfully been applied.

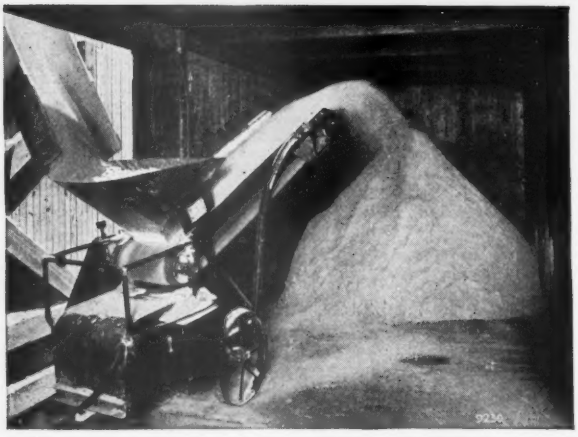
Cement Mill Cooler Bearings
Sheet Leveler
Mosser Grinder Rolls
Calenders—Paper
Calenders—Rubber
Cranes
Butterworth Driers
Rubber Mixer (Banbury)
Shaker Conveyor Screen
Paper Slitter
Drier Roll (Steam Glands)
Stuff Pump (Paper)
Strip Mills
Mine Locomotives
Boring Mills
Rotary Kiln (Metal Heat Treating)
Water Turbine
Tube Straightener
Shears
Scarfers
Charcoal Elevator
Polishing Machine (Glass)
Jaw Crusher
Hopper Grinder
Hot Necks of Sheet Mill
Ball Mills
Cabinet Planer
Fire Engine Pump

KEYSTONE GREASE
The Master Lubricant
TRADE MARK REG. U.S. PAT. OFF.

DIFFERENT plants, operating under different conditions with different types of machinery, require different methods and forms of lubrication. All the knowledge of scientific plant-operation gathered by our lubrication engineers is at your disposal—a survey of the conditions in your plant and our recommendations will cost you nothing.

The Quick-and-Easy Way to Load Box Cars





WHY not load your box cars mechanically with the Pratt Box-Car Loader?

They replace the wheel-barrow-plank "back-breaking" way. And, under ordinary working conditions, one man and a Loader can load a box-car with sand, gravel, fertilizer, or any bulk material in less than an hour.

Isn't this a big improvement over the old way?

The Pratt Box-Car Loader is a self-contained portable belt conveyor. It is easily wheeled into the door-way of a box-car, to a position where the material can be delivered to it steadily either by a chute or belt conveyor.

One man can set the Loader into position, fill one end of the car, reverse the Loader and fill the other end.

We have a few of these excellent Loaders in stock, and can make immediate shipment. Price as low as $485.00. It will soon pay for itself, in time and labor saved.

1307

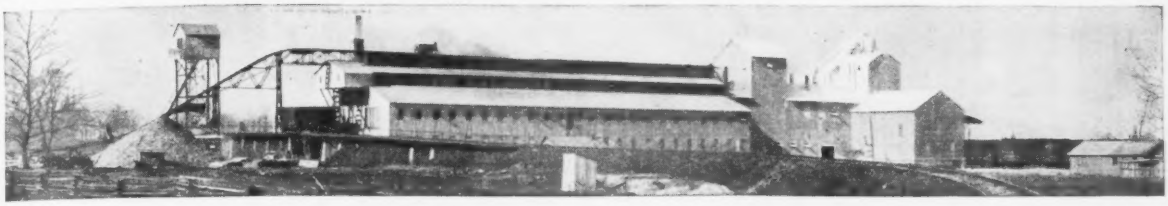
LINK-BELT COMPANY

PHILADELPHIA - - - - 2045 Hunting Park Ave.
CHICAGO - - - - - - - - 300 W. Pershing Road

LINK-BELT

Pratt Box-Car Loader

When writing advertisers please mention ROCK PRODUCTS



General view of plant of Ohio Hydrate & Supply Company

Twenty-five cents a ton is the total cost including depreciation, interest, power, repairs and labor to the Ohio Hydrate and Supply Company using Raymond Pulverizers which take their lime from the hydrator, grinds and air separates it, and delivers the finished product to the storage bin.

One of the three Raymond Pulverizers is shown to the left and back of the Schaffer Hydrator

Raymond Roller Mills and Pulverizers equipped with Air Separation will perform the same service and at a reasonable cost on your fine grinding problem.

Raymond Roller Mills have been found to be the most economical pulverizing machines on the market for hundreds of manufactured products and nearly all of the non-metallic minerals and similar materials. They grind these materials to any fineness desired and their durabliity is best shown by the fact that most of our customers estimate their life at twenty years or more, which is unusual for grinding equipment.

Raymond Pulverizers perform a like service on the softer materials like clays, hydrated lime, litharge, etc., giving continuous 24-hour service if needed, and their cost of operation is unusually low.

When you consider grinding equipment for your next pulverizing problem, bear in mind that there are two sides to the cost question, first, the original cost and, second, the operating cost, of which the latter is the most important.

Many Raymond Mills are saving their first cost each year they operate.

Raymond Bros. Impact Pulverizer Co.

1301 N. BRANCH ST. CHICAGO, ILL.

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Western Office, 1002 Washington Bldg., LOS ANGELES